

THE RAILWAY GAZETTE
A Journal of Management, Engineering and Operation
INCORPORATING
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ELECTRIC RAILWAY TRACTION

A Supplement illustrating and describing developments in Electric Railway Traction is presented with each copy of this week's issue.

One Hundred Years of Publication

WITH last week's issue THE RAILWAY GAZETTE and the journals now incorporated with it completed one hundred years of continuous publication and we now enter upon our second century. By a happy chance we do so within a few days of the Silver Jubilee, so that this important landmark in our career will be for ever associated with a date of national significance, and a period when the country as a whole turned to face the future with a new heart by taking stock of the too easily forgotten accomplishments of the past. For us centenary and jubilee are closely linked, since one quarter of our life has been during the reign of King George V, while throughout seventy-three of the preceding seventy-five years during which we were recording the steady growth of the railway industry, there were on the throne two Sovereigns whose names helped to make British ideals and enterprise respected the world over—Queen Victoria and King Edward VII. Elsewhere in this issue we refer in more detail to the history of this journal and the papers incorporated with it, going back to the first issue, on May 1, 1835, of *Herapath's Railway Journal*, then called *The Railway Magazine*. In the bound volumes of these publications will be found the story of railway pro-

gress in the past hundred years told week by week by contemporary observers and commentators. To recapitulate it in one issue would have been impossible, apart from which we feel that the most fitting celebration of our birthday is to produce a number conforming with our century-old policy of recording current railway news. For the same reason we have not made our centenary issue an excuse for asking our regular and occasional advertisers to give us a birthday present in the form of an extra or enlarged advertisement in celebration of the event, well knowing that many firms deprecate the growing practice of seeking to defray the cost of special events by calling for support from manufacturers in concert programmes and the like. This issue does, however, give us the opportunity of thanking those of our readers who have already sent us congratulatory and encouraging messages on our centenary. We hope to publish a selection of these in our next and subsequent issues, and to be privileged to justify the kind sentiments therein expressed for many years to come.

* * * *

An Epoch Making Century

In no other single century since history was recorded has so great a material change come over the world as in the past hundred years. This change is not the culmination of previous centuries of steady progress, but a sudden blossoming of material wealth due to the discovery of means to harness solar energy to the task of producing the goods and services desired by man. Wealth is the ability to produce and deliver these things, and production may be briefly, but comprehensively defined as the conversion of one thing into another by the application of energy. Thus a locomotive was, in its embryo stage, nothing more than a quantity of earth in the form of iron and other metal ores. Energy applied to this material—first to excavate it, then to transport, melt and refine it, then to shape and assemble the resultant metal—produced finally the machine which should itself be harnessed to the latent energy of fuel to produce the service of transport. Until man's genius devised the means to extract energy from the hidden reserves of the sun, his productive capacity was restricted to the expenditure of the energy currently generated by the consumption of food by human beings and domestic animals. This discovery has given rise to our modern industrial civilisation, the greatest civilisation in all the history of man. Even so we are only on the threshold of our powers, and, properly handled, as we believe it will be, the future holds the promise of far greater things still.

* * * *

The Week's Traffics

Latest returns of the four group companies cover the week including Easter Monday, 1935, and compare with those for a normal week in 1934, so that passenger train traffics are up and merchandise and coal class receipts are down.

	17th Week				Year to date.	
	Pass.	Goods &c.	Coal &c.	Total.	Inc. or dec.	%
L.M.S.R. ..	+ 51,000	- 68,000	- 54,000	- 71,000	+ 27,000	+ 0.45
L.N.E.R. ..	+ 52,000	- 36,000	- 47,000	- 31,000	- 187,000	- 1.35
G.W.R. ..	+ 22,000	- 42,000	- 35,000	- 55,000	- 64,000	- 0.84
S.R. ..	+ 33,000	- 15,500	- 3,500	+ 14,000	- 26,000	- 0.45

Comparing the complete Easter holiday periods for the two years it will be found that passenger train earnings in the 1935 fortnight were up on all four group railways, the increases being £70,000 on the L.M.S.R., £41,000 on the L.N.E.R., £17,000 on the Great Western, and £24,000 on the Southern. Merchandise receipts were £18,000 up on the L.M.S.R., £9,000 down on the L.N.E.R., and £4,000 down on the Great Western, and

on the Southern there was no change. Coal class traffics were uniformly down, with decreases of £47,000 on the L.M.S.R., £29,000 on the L.N.E.R., £12,000 on the Great Western, and £5,000 on the Southern. For all four companies together the takings for the holiday fortnight in 1935 amounted to £5,700,000, an increase of £64,000 on the corresponding period in 1934. The Irish traffic week ends on Friday, and for the period from Easter Eve to the following Friday inclusive the Easter Holiday traffics, compared with 1934, show increases, on the Belfast & County Down from £3,881 to £4,160, on the Great Northern from £19,000 to £20,700, and on the Great Southern from £57,182 to £60,620.

* * * *

L.N.E.R. Assessment

The Railway Assessment Authority decided on April 27 that a nil assessment should appear in the completed valuation roll of the undertaking as a whole in England and Wales of the London & North Eastern Railway Company. This followed representations made to the authority by the railway company and certain local authorities with respect to the figure of £3,500,000 appearing in the draft valuation roll as the "cumulo." The railway company maintained that a nominal figure should be substituted, and the local authorities that the amount should be £5,000,000. In giving the decision the Chairman of the authority explained that when the cumulo of £3,500,000 was fixed there had been no decision upon the construction of the Act of 1930, and the authority was unanimous in thinking that it would be fair and just to give the tenant £7,400,000 odd and the landlord £3,500,000 out of the net receipts of £10,904,195. But, owing to the principle laid down by the Railway and Canal Commission in the Southern Railway case, the estimated value of the tenant's chattels was not likely to be less than £69,000,000 nor the percentage on that amount to be less than 15 (amounting to £10,350,000), the total estimated tenant's share would more than absorb the net receipts, and the net annual value would, therefore, be nil. Should this figure be eventually upheld, there will be difficult problems ahead for the local authorities and the Railway Freight Rebates Fund. The position of that fund was fully discussed in an editorial article in the issue of March 29 last.

* * * *

The Decline of the Horse

The fifth census of horses made by the Army Council shows that on May 12, 1934, there were 628,698 fewer of these animals in Great Britain than on June 4, 1924. These figures do not include the 14,834 horses owned by the four railway groups and London Transport. Such a decline over the ten years when motor vehicles multiplied so rapidly is not surprising, but there is little doubt that the example of the railways has done something to accelerate it. The heaviest falling off, from 197,514 in 1924 to 65,357 in 1934, is in the light and medium trade and the trotting vanner classes. In other words, industrial collection and delivery services have followed the policy of mechanisation so successfully pursued by the largest organisations in the country handling traffic of this kind. The motor van and lorry were rivals against which the horse could not stand, but it has found a still more formidable competitor in its own mechanical counterpart, which possesses an ease of manoeuvre and a flexibility which have nowhere been better demonstrated than when fulfilling the widely varying demands of railway service. In London, the census shows 6,578 heavy horses and heavy trotting vanners. Of these 1,789 are over twelve years of age.

Evening Excursions All the Year Round

Although evening excursions were at first a summer facility, their extension through the winter has met with considerable success. The L.N.E.R. announces that 781 such trains were run in the winter months and conveyed some 300,000 persons, mainly from outlying districts to large towns. London, of course, was served from the nearer provincial centres, the residents of which were able to visit the capital by special express trains at fares of about five miles a penny. Travel is a commodity which need not be subject to seasonal fluctuations in demand, provided it can be accomplished with equal comfort under all conditions of weather and time. This requirement is fulfilled by the railways alone, and the L.N.E.R. has wisely recognised that winter nights, far from drying up the flow of traffic, merely change its direction. Summer causes a fresh reversal, for which the company is ready with a large programme of evening excursions from town to sea and country, and next winter such facilities will be introduced on a more extensive scale than during that now passed. The country need no longer hibernate from October to April.

* * * *

Carriage Advertising Exhibition

What is—so far as we are aware—a novel form of railway trade advertising, was staged by the Southern Railway at Cannon Street station on May 1. This took the form of an exhibition of carriage advertising displayed in samples of the most recent types of Southern coaching stock, both steam and electric. By special invitation those interested, either directly or indirectly, in this form of advertising were thus able to appreciate its particular advantages when carried out by a line like the Southern, which serves an area inhabited by about one-third of the total population of England. The handsome upholstery, panelling and fittings of the new stock exhibited, formed a suitable background for the best style of panel advertisement. Suggestions and designs, as well as inclusive quotations for designing, supplying and exhibiting these panels are supplied by the railway, if desired, and, as this form of advertisement is under glass, there are no maintenance charges. As arranged in the Southern stock, no two advertisements appear in adjacent panels, a detail which adds to the attractiveness of the scheme. Another feature of it is that these panel advertisements may be distributed throughout the system or confined to certain specified areas or train services, as desired.

* * * *

The Twentieth Century Limited

An acceleration of considerable note, effective from April 28, is announced from the United States. The famous Twentieth Century Limited express of the New York Central Lines, which has run for all but 33 years and, it is claimed, has earned more gross revenue than any other train in the world, came down to a run of 17 hr. in both directions between New York and Chicago. The distance is 961 miles, giving an overall average speed of 56.5 m.p.h., and stops are included at Harmon (where the change-over from electric to steam working takes place), Albany, Syracuse, Buffalo, the outskirts of Cleveland, Toledo, Elkhart, and Englewood. It was in 1932 that the schedule of 20 hr., which had remained as the standard for so many years, was cut to 18 hr.; in 1933, in celebration of the Chicago Exposition, a further 15-min. cut was made; and the acceleration now being enforced makes a total quickening of 3 hr. in three years. During the last ten years, the Twentieth Century Limited has handled more than 1,600,000 passengers; and recent

improvements in its palatial equipment include air-conditioning throughout. Departure from New York is now at 5 p.m. daily, and arrival at Chicago at 9 a.m.; in the eastbound direction the change from Central to Eastern time at Toledo entails a start from Chicago at 3 p.m. to reach New York at 9 a.m. the next morning. The previous speed limit of 70 m.p.h. is being raised to 75 m.p.h. in order to permit the faster running necessary.

* * * *

The Resignalling of Hull

The Station box and the Park Street box at Hull, which are 238 yd. apart, are equipped with power frames of 143 and 179 levers respectively, and the points and signals are operated electro-pneumatically. Park Street box was opened in July, 1904, and the other in the following December; they have, therefore, been in use for thirty years and are the oldest electro-pneumatic frames on a main line in this country, except that at Bolton on the L.Y.R. section of the L.M.S.R., which was opened in September, 1903. It has now been decided to replace the two boxes at Hull by a single one, to be fixed near the present Station box. The points and signals will be operated electrically by a route-lever panel frame similar to that at Thirsk, illustrated on page 49 of our issue of January 12, 1934. Track circuit will be put in as far as West Parade Junction box, which is 727 yd. west of the present Station box. A diagram of Hull is to be found on pages 722-23 of THE RAILWAY GAZETTE for June 3, 1927, in connection with the serious head-on collision there on February 14 of that year.

* * * *

A Handy Guide to Wood Preservation

Possibly the most useful function of the various engineering institutions is to provide meeting places where fresh engineering discoveries or works can be described and discussed. Most of the papers presented tend to further knowledge in one direction or another, but now and then papers of a somewhat different kind are read, these being concise summaries of all that is generally known on particular subjects, so presented as to be handy for future reference, especially for the younger members who are still learning the rudiments of engineering. Institutions which invite the preparation of such papers act also as repositories of scientific and engineering knowledge. Mr. F. T. Bowler, M.Inst.C.E., Fellow of the Permanent Way Institution, has performed the very useful service of presenting before the latter institution a brief but particularly informative and well illustrated paper on the "Creosoting of Sleepers." Nothing in the paper is new but as a description of the way in which sleepers are attacked by parasitical fungoid growths, and of the measures commonly taken to preserve them from destruction, it is a model of lucidity and brevity. Emphasis is finally and very rightly laid on the waste which would result from any relaxing in the fight against the loathsome enemy of decay. Not only would present timber resources be taxed to capacity, or even beyond that limit, if the practice of creosoting were to stop, but sleeper renewals would necessitate about three times the occupation of the lines by repair gangs.

* * * *

A Flying Junction at Mainz

In our issue of April 13, 1934, we referred to the opening out of the tunnel under the Kästrich Hill at Mainz on the German State Railway. This work has been followed by the construction of a flying junction at Mainz South, where the line to Darmstadt and Frankfurt turns away from that

to Worms. Previously the line to Worms crossed that from Darmstadt on the level and this, besides being a source of possible danger, led to a great deal of delay at certain times. Even when the trains were fairly punctual, waits totalling 40 minutes daily were experienced, and they became greatly increased when irregularities crept in. The existence of this junction made it difficult to effect certain desirable timetable changes. Under the 1933 national work programme a large sum was voted to improvements at this place, including better floodwater ways, strengthening of the Rhine bridge, and realignment of tracks. This, with the new flyover, was begun at the end of that year and finished in 12 months at a cost of 1,600,000 RM., including the installation of electric power signalling at Mainz South. About 250 trains use the junction daily, and already a marked improvement in the working has been brought about by these improvements, which are illustrated in our contemporary *Die Bautechnik*.

* * * *

Non-Bogie Coaches

The annual railway reports show that the number of 4-wheeled and 6-wheeled coaches running on British railways is steadily decreasing; there remained at the end of 1933 only 5,464 of such vehicles. The number at the end of 1928 was 12,125. In 1933, of the non-bogie stock, the G.W.R. had 540 4-wheeled and 264 6-wheeled, the L.N.E.R. 202 and 759, the L.M.S.R. 436 and 2,834, and the Southern Railway 84 and 405 respectively. The carriage building programmes now being carried out on the L.N.E.R. and L.M.S. will doubtless be reflected in the next statistics, but it will probably be some time before the whole of the rolling stock in use on the British railways is of bogie type. On the Continent 4-wheeled and 6-wheeled passenger vehicles were still being built as recently as two or three years ago, but practically all new construction now is of the bogie type. In Germany, at any rate, 4-wheeled stock was subject to a speed limit, but with the general tendency now to accelerate to the maximum possible degree, anything in the nature of types of rolling stock carrying restrictions against speed is to be avoided.

* * * *

Modern Locomotive Performance

As we have already announced, the spring timetables of the L.M.S.R. include some new fast schedules which raise the total mileage booked at start-to-stop average speeds of 60 m.p.h. or over to 1,235 miles a day. Last Monday these accelerations came into force and all of the six important up expresses concerned arrived at Euston on or before time. In achieving this result some noteworthy locomotive performance is called for, a sample of which was provided by the 9 a.m. train from Perth which has now been accelerated to run the 62.8 miles from its last stop, at Blisworth, into Euston in 62 minutes. On the inaugural occasion a "Royal Scot" class locomotive No. 6116, *Irish Guardsman*, in charge of Driver L. A. Earl and Fireman W. Lapham of Camden shed, had a gross load behind the tender of 425 tons, yet the 62.8 miles were covered in 59 min. 46 sec., at an average speed of 63 m.p.h. On this run the lowest speed up the long climb to Tring was 60 m.p.h., and the highest, near Wembley, 85.4 m.p.h. Only 23 min. were occupied in covering the 28.7 miles from Tring down to Kilburn, an average of 75.2 m.p.h. The fast running of this train over the final stage is all the more meritorious when it is considered that the engine is completing a through working from Carlisle, 299 miles from Euston. We are glad to refer to this record of typical modern locomotive performance.

Our Centenary

VERY few branches of industrial activity have been served for a full hundred years by a specialist press, but we are proud to say that the railway industry is among that select few, as last week THE RAILWAY GAZETTE and the publications now incorporated with it completed a century of continuous publication. On another page we outline some of the important changes in the requirements of railways as exemplified by its press during this period, and these changes are appreciated more readily when it is realised that on May 1, 1835, Great Britain possessed no steam-operated passenger railways of any great length excepting the Stockton & Darlington and the Liverpool & Manchester. Belgium and Germany were without railways, although both had lines rapidly approaching completion; Austria and France were still in the horse era of railways; and the U.S.A. was just beginning to appreciate the railroad as a powerful weapon in the advance westward. In England, however, the first main trunk line, that from the Metropolis to the important cities of South Lancashire, was being built, as was also the London & Southampton Railway, while the G.W.R. Bill was making its successful passage through Parliament. The British railway industry was therefore on the eve of its most momentous period of early development when *The Railway Magazine* (our earliest predecessor) made its appearance with the following *avant-propos*:—

The object of the Railway Magazine is to promote by every honourable means the interests of all Railway Companies: for this purpose the Editor invites communications from those who may have opportunity and inclination to aid him in his endeavours.

Anticipating some occasional opposition, the Editor deems it necessary to set out with an avowal which he trusts there will be no necessity of repeating; namely, that he holds no share in any Railway Company, and that his sole object in establishing this journal is to afford information at a cheap rate on the subject of the great national works now contemplated or forming in various parts of the Kingdom.

In its early years this ideal was maintained and it is possible even now for us to peruse without shame the first few volumes of our file. Engineering articles were given the prominence they deserved, and schemes for new railways were critically examined. A few years later the railway press was caught in the maelstrom of share speculation and found little place in its columns for other than prospectus advertisements, reports of company meetings, and stock quotations. Yet this departure from the initial high ideals was itself a true reflection of the condition of the railway industry. Despite early lapses and failures, railways as a whole have been probably the greatest contribution of an industrial age to civilisation and commercial progress. Such thoughts were happily expressed by the Right Hon. Sir Robert Horne, presiding over the annual general meeting of the Great Western Railway on February 27 last, when he said "This great organisation, of which those assembled here today are the modern representatives; is within six months of completing a public service extending over the most remarkable century of human progress known to history. During this epoch the company has experienced periods of vicissitude as well as of good fortune; of acute anxiety as well as serene confidence; of exasperating failure as well as encouraging success; but through all those times, good and ill, the reputation of the railway has stood high in popular favour and we are today the heirs of a system which absorbs our interest and commands our loyalty." Although referring only to his own company, which attains

its centenary on August 31 next, Sir Robert's words are capable of wider application as they epitomise the ups and downs which have attended all great railway enterprises. For a hundred years it has been our privilege to record these, and the many congratulatory messages we have already received encourage us to begin our second century with the hope and aim that our work may worthily follow that of our predecessors and prove of continued utility to the world-wide industry we serve.

* * * *

Railways and Parcels Post Rates

THE decision of the Postmaster General to mark the Jubilee celebrations by reducing parcels post rates and increasing the weight limit of Post Office parcels from 11 to 15 lb. as from July 1 is of very considerable importance to the railway companies because for a number of years they have conveyed over 90 per cent. of the parcels post on behalf of the Post Office. This important task is carried out by them under the provisions of the Post Office (Parcels) Acts, 1882 and 1922. The former Act places the railway companies under an obligation to convey by any train by which passengers, goods, or parcels are conveyed, all parcels which may be tendered for conveyance on behalf of the Post Office, provided that their conveyance does not prejudicially affect the convenient and punctual working of these trains. The Act also requires each railway company to afford all reasonable facilities for the receipt and delivery of parcels post bags and receptacles at any of its stations and to perform the service of transferring all such bags and receptacles to and from Post Office vehicles at the forwarding and receiving stations. The remuneration payable to the companies for their services was fixed by the 1882 Act at eleven-twentieths of the Post Office receipts from the conveyance of all such rail-borne parcels, but the 1922 Act altered this percentage to two-fifths of the Post Office receipts from rail-borne parcels, calculated at the current postal rates.

The Act, however, gave the companies the right to apply for a revision of their remuneration if the number of parcels conveyed other than by railway should exceed 10 per cent. of the total number of parcels forwarded by post, whether conveyed by rail, road or any other form of transport. It has not been necessary for the companies to exercise this right, as more than 90 per cent. of the Post Office parcels have been conveyed by rail since that date. The extent of the business can be judged from the fact that the Post Office returns indicate that over 150 millions of parcels are dealt with annually and thus the railway companies convey at least 135 millions, either wholly or partly by rail, and receive for their service 40 per cent. of the gross revenue derived by the Post Office therefrom. At the same time the railway companies' own parcels traffic is of considerable magnitude, the number of parcels under 2 cwt. conveyed annually being in the neighbourhood of 90 million. While no statistics are readily available showing how many of these weigh less than 11 or 15 lb., there can be no doubt that they represent a very large number as for some years the companies have been carrying some millions of very small parcels in connection with newspaper coupon and gift schemes, as well as many catalogues and samples. The power to quote agreed charges has also enabled the railways to secure a substantial additional parcels business to rail without prejudicing the position of the Post Office so far as parcels up to 11 lb. are concerned.

The reduction in the parcels post rates will automatically involve a substantial decrease in the Post Office payments to the railway companies in connection with the conveyance of these parcels, assuming there is no variation in the quantum of the traffic. It is fair to assume, however, that the reduced rates will cause a considerable increase in the parcels post business and, should this prove to be the case, the companies will not suffer such a substantial reduction in their remuneration from the Post Office, but they will have to perform a considerably increased amount of work before they become entitled to the same total payments. Of even more importance to them is the fact that the reduced parcels post rates and, in particular the increase in the weight limit from 11 to 15 lb. will undercut the majority of the existing railway parcels rates and may well result in the transfer to the parcels post of a large number of the parcels which are at present rail conveyed throughout. It is obviously impossible to estimate with any accuracy the extent to which such a transfer will materialise, but, whatever its extent, it would clearly be impossible for the companies to reduce their expenditure proportionately to the loss of revenue which they would sustain by reason of their earnings being reduced from 100 to 40 per cent. It will, therefore, be necessary for the companies to review very carefully the whole of the considerations involved, especially having regard to the very harmonious relationship which has existed with the Post Office for a long period.

Leicester Square Station

WHEN five years ago the Underground group of companies undertook an £11,000,000 programme of extensions and improvements, public interest was turned towards the more spectacular parts of the scheme, namely the northern and western extensions of the Piccadilly Line. Yet these works necessitated taking in hand simultaneously a comprehensive plan of station enlargement and modernisation in central London which only now is nearing completion and has involved engineering operations of considerable difficulty such as frequently accompany the task of providing new facilities in a built-up area. In fact, these central London works involved an expenditure of £3,500,000, or 50 per cent. more than that of the western extension, and within £500,000 of the estimated cost of the northern extension. The financing was made possible by the Development (Loans, Guarantees and Grants) Act, 1929, and the whole of the money so raised has been expended on British labour and materials by the London Passenger Transport Board and its predecessors, the Underground companies.

The original plans for a station at the junction of Charing Cross Road and Cranbourn Street were made in connection with the Charing Cross, Euston & Hampstead Railway which was authorised in 1893. Difficulty in raising capital prevented construction being taken in hand and this railway still existed only on paper when the late Mr. Charles Tyson Yerkes came to England and secured a controlling interest in the company. He also took over the Brompton & Piccadilly Circus Railway powers of 1897 and the Great Northern & Strand Railway powers of 1899; these schemes he merged and secured Parliamentary sanction for a linking line between Piccadilly & Holborn. This crossed the Hampstead route at the point now called Leicester Square station, and thus an exchange station was designed from the beginning of actual building work. Prospectuses of the period gave it the tentative name of "Cranbourn Street," but the far better known Leicester Square was eventually selected

as the title—albeit with a very broad interpretation of street geography.

Public traffic at the station began on December 15, 1906, when the Piccadilly Line was opened, but it did not begin its career as an exchange station until the following year, when on June 22, Mr. Lloyd George, at that time President of the Board of Trade, opened the Hampstead tube. On April 6, 1914, the latter was extended from the Strand to the District & Bakerloo Railways Charing Cross station on the Embankment, thus increasing enormously the potential traffic. After the war the Hampstead tube was projected northwards to Hendon in 1923 and Edgware in 1924, and southwards to Kennington in 1926. The last-named enabled through running via the City & South London Railway to Morden. Thus it was obvious in 1930, when the Piccadilly tube extensions were planned, that Leicester Square and other important central London stations built a quarter of a century earlier were hopelessly inadequately equipped to deal with further large increases of traffic. The 9,000,000 passengers who used Leicester Square in 1909—have grown to about 27,000,000 per annum, so that the amenities of the new station, described on pages 857 to 862 of this issue, are certain of extensive public appreciation.

San Paulo (Brazilian) Railway

THE main line runs inland from the port of Santos for 86½ miles on the 5 ft. 3 in. gauge through San Paulo to Jundiáhy. It provides an outlet at Santos for a very large area, and is one of the largest coffee carriers in the world. There is, however, under construction the Mayrink-Santos line of the Sorocabana Railway, which, when completed will give that company an independent access to the port of Santos. At present the new line has been opened to a point 83 km. from Mayrink. The San Paulo Company has also a Bragantina section of 67 miles on the metre gauge. During the year 1934 for which the report has now been issued, the quantity of coffee carried for export was 673,885 tons, contrasting with 902,897 tons in 1933, which was the heaviest recorded since 1924. The traffic receipts were increased by a special item of £77,174, representing a payment of £77,174 on account of outstanding freight on coffee carried to control warehouses in the vicinity of the company's railway during 1931, 1932 and 1933. In currency the operating ratio in Brazil was 75.56 per cent. in 1934, against 73.15 per cent. in 1933, and expenditure in sterling was substantially increased under general charges by an amount of £62,872, for loss on remittances. The general financial position is indicated in the accompanying table:—

	1934	1933
Gross receipts	1,636,750	1,577,893
Expenditure	1,336,918	1,256,598
Net receipts	299,832	321,295
Income from investments, &c. ..	34,853	27,793
Total net income	334,685	349,088
Debt interest and other charges ..	274,877	292,139
Dividends	125,000	170,000
Brought forward	95,249	208,300
Carried forward	30,057	95,249

The 1934 investment income includes £10,000 transfer from reserve for loss on exchange, and under debenture interest and other charges there is a new item of £40,169 "amount payable to associated company under agreement." In the 1933 figure of £292,139 for debenture interest was included £75,000 set aside as a reserve for loss on exchange. The dividend on the ordinary stock for the year 1934 is 2½ per cent. (free of tax) comparing with 4 per cent. free of tax for 1933. A new schedule of rates and fares came into force on January 1, 1935.

LETTERS TO THE EDITOR

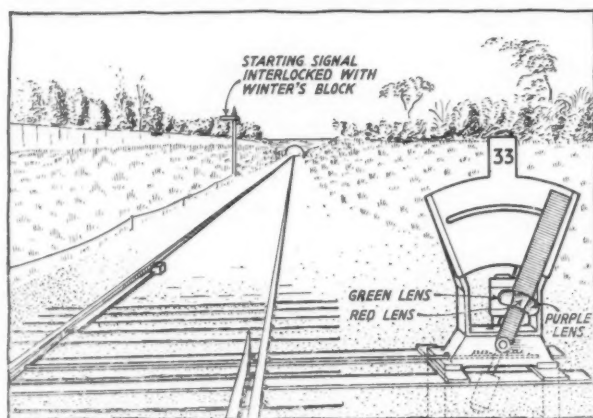
(The Editor is not responsible for the opinions of correspondents)

Point Indicating Ground Signal

Rockside, 44, Valkyrie Road,
Westcliff-on-Sea, March 29

TO THE EDITOR OF THE RAILWAY GAZETTE

SIR,—I was greatly interested in the new pattern ground signal shown on page 611 of THE RAILWAY GAZETTE for March 29, but am somewhat surprised to see that it is stated that "this indication of improperly thrown points is new to railway signalling and should prove a useful contribution to safety in operation, especially on lines where the infrequency of trains does not warrant a fully signalled and interlocked layout at stations and crossing loops."



Stoney patent three-indication point indicator as used on the Madras Railway in 1894

In this connection, may I inform you that Mr. E. W. Stoney, when District Engineer on the Madras Railway (and later as Chief Engineer of the railway), at Podanur District, patented a similar Indicator under Patent No. 2904 of February 9, 1894, which showed three indications, the glasses being in same respectively: green for main line; purple for the loop or siding; and red for the improperly thrown points.

I am forwarding you a pamphlet showing a similar indicator fixed at Podanur station in 1894, but the base casting of the same is slightly different from the sketch shown in the patent abridgment, as it was decided then to have a cast iron box made with a counter-poise weight for the same. I thought it might be of interest to you to know that over forty years ago I had the pleasure of fixing this class of indicator on the Madras Railway.

Yours faithfully,
JAS. PUNTER

Speeding Up

Tisbury, Wilts, April 11

TO THE EDITOR OF THE RAILWAY GAZETTE

SIR,—The announcement that the London & North Eastern Railway has decided to run a train, commencing in October, between King's Cross and Newcastle, timed on the recent experimental runs, is very gratifying, since experimental runs, however successful, do not always result in a corresponding benefit to the public. This was notoriously the case with the 50-minute experimental run between Victoria and Brighton in 1903, to which I called attention in your issue of March 15 last. It was also the case with the experimental run from Waterloo to Bournemouth in 1899. The Bournemouth run was made when Sir Sam Fay was Superintendent of the Line of the London & South Western Railway, and, in a letter published in *The Times*

on August 19, 1925, after referring to the run as having been made on a Sunday 26 years previously, he wrote as follows: "The trip of 108 miles with several service slacks was performed in 1 hr. 50 min. On the Monday following the Chairman of the company sent for me and said, 'Don't do it again, Fay, not in my time—not in my time.' Even the more liberal timing of 2 hr. to Bournemouth proposed in the same year was disallowed. Handbills advertising 2-hr. trains were printed but were not issued. The public had to wait till 1911 before 2-hr. trains were put on, and today that is still the best time—though ten minutes longer than that of the experimental run thirty-six years ago.

There are many accelerations long overdue, unless the decade which began in 1900 is to be regarded as a climax. May I mention one or two?

Exeter: In 1903 the London & South Western Railway ran trains between Waterloo and Exeter, up and down, in 3 hr. 15 min., calling only at Salisbury, and last summer, after an interval of more than thirty years, the best trains, calling only at Salisbury, ran to the same timing up, and with an improvement of only one minute down.

Birmingham: The first 2-hr. train from Birmingham to Euston was put on by the London & North Western Railway in August, 1902 (5 p.m. *ex* Birmingham); this was soon followed by other trains, up and down, similarly timed. Today 2 hr. is still the best advertised time of the London Midland & Scottish Railway. The trains travel faster, since all the 2-hr. trains now stop at least once and were formerly non-stop, but this does not benefit London-Birmingham passengers.

The Great Western Railway began running to Birmingham in 2 hr. in 1910, and the timing is the same today. As in the case of the L.M.S. the running is, on the whole, faster than in 1910, but the time gained has been absorbed by the introduction of an intermediate stop.

Bristol: The Great Western Railway ran trains between Paddington and Bristol in 2 hr. as far back as the autumn of 1903. Over thirty years have elapsed, and 2 hr. is still the best timing. The trains via Bath run faster than formerly but, here again, the time gained has been absorbed by a stop at Bath—where formerly a coach was slipped.

The introduction of the 2-hr. timing between Paddington and Bristol in 1903 followed on the unsuccessful promotion in Parliament, by dissatisfied Bristol residents, of a Bill for an independent line to London—the Bristol, London & Southern Counties Railway. Had this rival scheme been revived in the following year there can but be little doubt that the Great Western Railway would have run trains between Bristol and London in 110 min.; some such timing was foreshadowed by the late Charles Rous-Marten in his article on "British Locomotive Practice and Performance," in *The Railway Magazine* for October, 1903 (Vol. XIII p. 263), but in the absence of competition Bristol still remains 2 hr. from London by rail.

Yours faithfully,
REGINALD B. FELLOWS

DERELICT STATIONS AS CAMPS.—With the closing down of the Fort Augustus to Fort William branch of the L.M.S.R., the stations of Fort Augustus, Invergarry, and Gairloch have lain derelict. Now they are being transformed into camping quarters for the use of hikers and climbers. Comfortable beds, blankets, cooking utensils, hot and cold water taps, and many other modern conveniences are being installed, and the apartments are likely to be ready for use within the next week or so. The station at Gairloch, which can accommodate two persons, will be rented out at £1 17s. 6d. a week, while the slightly larger stations at Fort Augustus and Invergarry, capable of accommodating three or four, will be available at £2 2s. a week.

PUBLICATIONS RECEIVED

Selbsttätige Warnanlagen für Wegübergänge (Automatic Warning Signal Installations for Level Crossings). Publication No. 280. Vereinigte Eisenbahn Signalwerke, Blockwerk, Berlin-Siemensstadt.—This two-page leaflet, illustrated by five photographic views, briefly traces the development of the level crossing problem from the days of horse traffic and emphasises its growing seriousness now that motor vehicles are so heavy and numerous. The system in general use in Germany of protecting crossings by barriers of the lifting type worked by gates or signalmen is criticised and the advantages of automatic colour-light signals are set forth. Some brief technical notes on the apparatus used for automatic warnings then follow, with an interesting reference to the mercury thermal flashing switch.

Marchandises Dangereuses (Dangerous Goods). Second Supplement. By Dr. Jules Aeby. Antwerp: published by the author at 29, Avenue Della Faille. 9½ in. × 6 in. 96 pp. Price £1 (20 Belgas).—This is the second supplement to a work by Dr. Jules Aeby which was first published in 1910 and subsequently revised in 1922. The first supplement appeared in 1930. In the three volumes together there are enumerated 6,039 types of goods classed as dangerous from the point of view of their carriage by water, with a brief outline of their characteristics. The author has taken the word "dangerous" in its widest sense, and it rests with the reader to adapt his description to particular conditions. The present supplement adds 91 paragraphs dealing with commodities not previously mentioned, while 27 have been revised. The text is in French, English, and German.

Accounting for Management Control.—This well-illustrated brochure produced by Powers-Samas Accounting Machines Limited is primarily an explanation of the firm's system and of its scope. Recording, sorting, tabulating—these three principles of accounting are effectively complied with by the Powers punched-card accounting system, as the original record can be mechanically sorted and tabulated, rapidly and without loophole for error. Ever-ready statistics, so necessary in modern industry, are also available as part of the accounting procedure at no extra cost. Purchase, sale or other accounting movement is indelibly recorded by the perforation of a standard sized card for each operation. The record so established by the first machine is passed to a second, which mechanically senses the perforations and collects all the cards of each customer at a speed of 400 cards a minute. The cards so sorted can then be placed in a third and last machine, the tabulator, which prints in figures and letters, on a continuous roll of paper,

all the details recorded upon each card. More important still, this machine also totals all the debit and credit items of each customer, prints the totals, deducts the credits and prints the balance. Finally, a control account sheet is passed through the tabulator to record the accumulated grand totals and balances for all the customers. Not only is a sales ledger thus produced, but salesmen's commission accounts, sales daybook customers' statements and other sales statistics can be automatically produced. All vital accountancy information is therefore rapidly and accurately turned out by these three machines. The remainder of the brochure is devoted to a description to the Powers-Samas equipment, of which there are two ranges, one of small and the other of large capacity. The adaptation of the various types of card and machine to widely different needs is also explained, there being practically no organisation which is not covered by some variety of the equipment.

Summer Holidays Abroad.—In "Summer Holidays Abroad" Thomas Cook & Son Ltd. again presents an annual travel guide of the widest scope and interest. There was a time when the main question to be decided by the intending traveller was where he would go. Today the anticipation and debate, which are by no means the least important factors in an enjoyable holiday, become more engrossing because there are so many ways of making a journey. Railway travel offers the train cruise, an institution now covering Germany, Italy, and, an innovation this year, Russia. For those wishing to make a single destination their objective, there are numerous facilities for railway journeys with reserved accommodation on the train and in hotels at prices little higher than that of the normal rail fare alone. Cruises, both long and short, holidays by air, and tours by motor coach are other facilities described in "Summer Holidays Abroad," which adds to its copious illustrations several full-page plates in particularly compelling colours. Although the book deals principally with European travel, the concluding pages deal with holiday tours in South Africa, Canada, the United States, and other overseas countries.

Excavators for Drainage and Irrigation Schemes.—Examples of draglines and shovels at work on drainage and irrigation schemes in many parts of the world are shown in a booklet published under the above title by Ruston-Bucyrus Limited, of Lincoln. Brief explanatory captions emphasise the points of interest in 33 well-reproduced full-page illustrations, and a foreword quotes a number of important irrigation schemes in which the firm's excavating machinery has played a notable part. Among these is the Sukkur Barrage in India, where 46

Ruston-Bucyrus draglines handled 120,000,000 cubic yards of excavation. The standard range of these machines comprises bucket capacities of from ½ to 4 cubic yards, but larger equipment with buckets holding up to 10 cubic yards is supplied to order. The motive power may be petrol, diesel, electric, or steam, and special long and wide caterpillar tracks are fitted where work has to be carried out on very soft ground.

New Wall Calendar.—A handsome view in colours by J. G. Rennie of Tantallon Castle, Scotland, figures on a new wall calendar for 1935 received from Bruce, Peebles & Co. Ltd., Edinburgh. Tear-off sheets with bold figures show each month at a glance, with the preceding and following months in smaller type alongside. The calendar is current from May, 1935, to April, 1936, and will prove to be of both practical and decorative value to any business premises.

Bakelite Gears and Pinions.—The manufacture of gears and pinions from Trefoil Bakelite is explained in the text and copious illustrations of this useful catalogue published by Bakelite Limited, 68, Victoria Street, S.W.1. The material has an advantage over most non-metallic substances from which gears are produced in being absolutely vermin proof and unaffected by atmospheric conditions. To these properties are added an elasticity sufficient to absorb shocks and intermittent stresses which would in some cases break down gears of metal or metal substitutes. Silence in operation is an outstanding feature of transmission by Bakelite gearing, and this characteristic makes it particularly appropriate for use with electrical machinery, the quiet running of which is sometimes nullified if associated with drives through metal gears. As well as directions for working Bakelite, the catalogue includes pages dealing with gear design, tabulated gear data and physical and mechanical properties of the material.

Aluminium Literature.—Working and finishing processes for aluminium are described by the British Aluminium Co. Ltd. in four handy booklets, which, in conjunction with the others in the series reviewed in recent weeks, form a valuable compendium for users of the metal. "Aluminium Finishing Processes" gives practical information on polishing, cleaning, matt finishing, anodic treatment, and painting. The welding by the oxy-acetylene process of sheet castings and tubes is described in "Aluminium Welding and Soldering," which also includes notes on electric welds and riveting. In the chapter on soldering there is an interesting description of the newly developed reaction process, using a chemical mixture which, when heated by a blowpipe to about 200° C., deposits pure zinc in a molten condition on the aluminium surfaces to be joined. "Aluminium Machining and Forging" and "Aluminium Sheet Metal Working" are the remaining booklets, which contain many useful workshop hints.

THE SCRAP HEAP

Perhaps when Linley Sambourne, of *Punch* fame, drew the accompanying cartoon to commemorate the cutting of the first sod by Mrs. William Arkwright at Chesterfield on June 7, 1892, of the Lancashire, Derbyshire & East Coast Railway, he little thought it would deserve such a title as "Thwarted" 44 years later. A

40 years service, including a year driving the West Riding Pullman. During the summer non-stop schedule of the Flying Scotsman between London and Edinburgh, Driver Taylor is in charge from King's Cross to Tollerton.

Driver Elkins of Old Oak Common, who spoke for the Cornish Riviera,



Thwarted!

line was actually constructed between Chesterfield and Lincoln with a number of branches, but the full scheme to connect Warrington and Sutton-on-Sea never materialised. The company was absorbed by the Great Central Railway in 1907, and, of course, now forms part of the L.N.E.R. system.

RAILWAY RHYTHM

In its search for old English institutions suitable for broadcasting on May Day, the B.B.C. this year selected our railway system as the basis of one item in a seasonable programme. We have already referred in our pages to certain dark doings with a roller skate whereby the Effects Department simulates the sound of a train in motion, but the public may rest assured that much of what they heard in "Railway Rhythm" was the genuine article. An important feature in the entertainment was the first public meeting between drivers of the Cornish Riviera, Royal Scot, Flying Scotsman and Golden Arrow expresses, who were interviewed in the studio by Mr. John Watt. Their combined period of service totals 159 years, of which Driver Abra of the Southern Railway, representing the Golden Arrow, contributes the useful proportion of 44 years spent on the footplate. He started his railway career earlier still as a cleaner at Battersea, L.C.D.R.

The Flying Scotsman was represented by Driver Taylor, who has seen

was made a fireman in 1902, and has been driving since 1905. The Royal Scot had its spokesman in Driver Earl, whose name is also connected with the Merseyside Express, the Royal Highlander, and other famous trains. His service extends over 34 years.

In addition, the programme included sound pictures of Swindon works, Camden Town running sheds, March Marshalling Yard and Clapham

Junction signal-box—the whole being interspersed with musical items intended to convey an impression of railway life and the observations on travel of B.B.C. humorists.

ENVY AND HATRED

A.—"If L.N.E.R. No. 10000 were pitted against L.M.S. No. 6399 what do you reckon the result would be?"

B.—"Probably enough to make the one green with envy and the other red with fury."

We have heard of "journalese." But what language is this, used in a recent railway publicity leaflet?—"New and novel, this innovation." "Tautologese."

ENGLISH AS SHE IS SPOKE IN BRAZIL

The following letter to the Leopoldina Railway from a client is reproduced exactly as received, apart from the suppression of the names of the station concerned and of the sender:—

Dear Gentlemen,

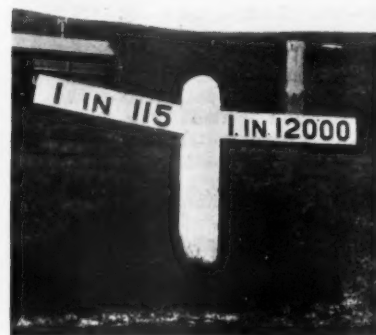
On the first days of Sept. p., they send me from ———, a packet with wool planks to my address, at the Railway station of here, but without any ticket nor advise, and so remained the packet all the passed time in the station, without any reclamation of my part.

Now they told me in the Station here, has been returned that colly to you. Therefor, I take me the liberty to ask you, if I could yet get the questionable packet send again to here, and how much are the occasioned expenses.

I would be very tankfully to you, to receive your kindly answer about this question,

Yours very truly,

The Ups and the Downs



A somewhat startling gradient post on Sheep Pasture incline, Cromford and High Peak Railway, compared with an example equally extraordinary for its modesty found in Scotland by a reader. It is interesting to recall that our spirited grandfathers were once so bold as to suggest running London-Manchester expresses over the Cromford line!

OVERSEAS RAILWAY AFFAIRS

From our correspondents

INDIA

New Railway Member

It is understood that Choudhury Zafrulla Khan was to take over the portfolio of Railways and Commerce on the Viceroy's Executive Council, in succession to Sir Joseph Bhore on April 13 when the latter was due to proceed to England. Sir Joseph's term of office has, however, been officially extended to May 25, so as to enable him to participate in the Jubilee celebrations in London as a Member of Council.

Spring Meeting of I.R.C.A.

In pursuance of the decision reached in 1933, that the Indian Railway Conference Association should hold two meetings annually, the 1935 Spring session of the Association was held at Delhi from March 21 to March 23 with Sir James Williamson, Agent of the Bengal & North Western Railway in the Chair. The main item of business was the consideration of the investigations which have been made at Calcutta by a committee with Mr. V. E. D. Jarrad, Agent of the Bengal-Nagpur Railway, as chairman, in connection with the simplification and revision of the general classification of goods. The results of a detailed analysis of goods traffic on the Bengal-Nagpur Railway was placed before the Conference. It is believed that a similar analysis for some of the other large railways will have to be obtained before definite conclusions are reached. The Conference also considered proposals for the amendment of certain sections of the Indian Railways Act with a view to enable the railways to deal effectively with the practice of travelling without tickets.

Amenities for Lower Class Passengers

Although the usual outcry in the Legislative Assembly continues to accuse the Railway Board of failing to enforce upon the railways the necessity for greater attention to the needs of third class passengers, it is common knowledge that large sums of money are spent annually on the provision of amenities for passengers. For the year 1934-35, the allotment under this head of expenditure is Rs. 38.21 lakhs, and the budget for 1935-36 provides no fewer than Rs. 62.30 lakhs for this purpose. The amenities include improved water supply, waiting rooms and halls, Indian refreshment rooms, booking facilities, latrines and sanitary arrangements, raised platforms and additions and betterments to lower class stock. Such expenditure is incurred almost entirely in the interests of lower

class passengers. In fact, the allotment for 1935-36 for additions and betterments to lower class carriages alone comes up to Rs. 42.69 lakhs or over three-quarters of the total. As Sir Joseph Bhore explained in the Assembly, the fact that the conditions of third class railway travel in India still need considerable improvement is due, not to any lack of interest on the part of the authorities, but to the adverse financial position of the railways for several years past. A point of no small interest in this connection is the enormous loss the railways are annually sustaining through fraudulent travel. If this drain can be checked by legislation and public co-operation, the railways will be in a better financial position to provide greater amenities for third class passengers.

Special Boat Trains

For some years past the Calcutta railways have been running special trains to Bombay during the home leave season. These trains have proved very popular as they run through to Ballard Pier and enable the passengers to go straight on board the steamers. The Bengal-Nagpur Railway administration is running several boat trains this season with no small success. The weekly Imperial Indian Mail on the East Indian and Great Indian Peninsula Railways runs in connection with the P. & O. mail steamers. This year it has also been decided to run a boat special from Lucknow to Bombay (Ballard Pier) for home-going passengers.

Dacca-Aricha Railway

Answering a question in the Legislative Assembly, the Financial Commissioner of Railways stated that the Government of Bengal informed the Central Government in September, 1933, that, after the most careful consideration, it had come to the conclusion that the construction of the Dacca-Aricha Railway was altogether undesirable and should not be proceeded with. The construction of an embankment across the spill of the River Dhaleswari would be a serious menace to the public health and to the agriculture of a large area. Such a danger to agriculture and public health far outweighed the benefit to communications which would accrue from the construction of the railway. The Government of India had consequently abandoned the project. In view of the popularity which the Calcutta-Dacca air service has obtained, the decision of the Government of India is considered judicious, as the bulk of the upper class traffic is likely to take to the air. Nevertheless the advantages of quick and uninter-

rupted transport of goods between Calcutta and Dacca without steamer ferry and a change of gauge may be sufficiently great for the project to merit further consideration in the future.

FRANCE

Opening of New Metro Line in Paris

A new Metro line, No. 11, running from the Châtelet in the centre of Paris to the Porte des Lilas, is now completed and was opened for traffic on Sunday last, April 28. An official party, comprising members of the municipal council and other local authorities, was recently conducted on a visit of inspection from end to end of the line by special train. It is intended shortly to extend this line into the suburbs as far as the district town hall of Les Lilas.

Eastern Railways and Road Co-ordination

An important agreement for the co-ordination of rail and road passenger traffic has been concluded by the Eastern Railways and the road motor passenger concerns in the Department of the Marne. The Eastern Railways undertake to close to passenger traffic* fifteen lines with a total length of 543 miles. Six of these lines, totalling 225 miles, radiate from Rheims to the towns of Châlons-sur-Marne, Reims, Challerange, Laon, La Ferté-Milon and Soissons. Of the other lines, the longest is one from Dormans to Revigny, a distance of 75 miles.

In the Marne agreement the signatories assent to the formation of a permanent regional committee, which will draft plans for the organisation of the new services and will supervise the rail and road co-ordination in the department. They also undertake to collaborate in order to give the public the best possible connections between road and rail services. Further, they will consider ways and means of issuing joint rail and road tickets and through registration of luggage. All road vehicles will be insured with companies of good standing, those seating more than 25 passengers being insured for 3,000,000 francs (£37,500 at 80 fr. to the £).

Fourteen Co-ordination Agreements throughout France

Fourteen rail and road co-ordination pacts for passenger transport have now been signed in France in addition to a few rail and waterway agreements. No rail-road pacts relative to goods transport have yet been arranged. None of the co-ordination agreements is in force, nor is any likely to be applied until the co-ordination system has been extended to cover the whole of France. To speed up the co-ordination plans an administrative regulatory

* As several of these are main lines, this applies, presumably, to local passenger traffic only.—Ed. R.G.

decree was signed on February 25, 1935, and published next day in the *Journal Officiel*. This supplements the original co-ordination decree, signed on April 19, 1934, and provides for the formation of technical committees in every department of France. These committees will conduct preliminary investigations and push forward co-ordination schemes for passenger traffic.

Goods transport has so far not been incorporated in the co-ordination system, except for two rail and waterway agreements. But even the waterway agreements have struck a snag, which may render them ineffective, according to the *Chronique des Transports*. In ratifying the waterway agreements, the Chamber of Deputies adopted an amendment, which allows barges to transport "various goods" instead of only cargoes in bulk. This leaves the waterways free to compete for the carriage of small consignments of valuable goods, which hitherto have formed the most profitable traffic of the railways. If this amendment is retained by the Senate, the effect of the waterways co-ordination will be nullified as far as the railways are concerned.

Eastern Railways Report

Shareholders of the Eastern Railways (Chemins de fer de l'Est) at the annual meeting on April 16 approved the report for 1934 and authorised the company to raise a loan of fr. 1,500,000,000 to meet current financial requirements. The report shows total receipts of fr. 1,536,768,837, against fr. 1,597,625,382 in 1933. Operating expenditure was reduced by fr. 69,567,697 or 4.39 per cent. to fr. 1,513,324,003, against fr. 1,582,891,700 the previous year. Taking all charges into account, the total deficit falling on the Common Fund of the French railways is fr. 426,591,584, against fr. 418,017,266 in 1933. The operating ratio decreased to 98.47 per cent., against 99.08 per cent.

Staff Cut by 10,000 in Three Years

M. Louis Marlio, Chairman of the Board, in his speech to the shareholders, stated that the company had continued to effect economies. The staff had been reduced by 10,000, from a total of 67,000 in 1931 to 57,000 in 1934. Last year alone the number of jobs abolished was 2,000. But the company's financial results were going from bad to worse. In 1934 the total receipts were only 65 per cent. of the figure for 1930, and they would fall to 56 per cent. for 1935, if the decline continued at the rate indicated by the first quarter.

As the Eastern system served an industrial area, the company had lost half its freight tonnage owing to the trade depression. Road competition had made inroads on the remaining traffic and this was responsible for half the deficit. Although road transport benefited by obvious advantages, the

railway, said M. Marlio, would still be in a position to meet the competition by means of railcars and increased speed if it were not for the unpaid services imposed by the Government, the military obligations, the compulsion to maintain a costly staff, and the restrictions on freight traffic.

Rich Lines Pay for Poor

The railway system was operated on the theory that the surplus of rich lines must offset the deficit of unprofitable lines and that receipts from valuable goods traffic must compensate for the carriage of raw materials at low rates. But nowadays motorcars took the cream of the traffic and left the poorly-paid freight to the railways. To avoid the loss of milliards every year, the Government must decide to alter its policy. What the railways needed was a more adaptable commercial system. They should give co-ordination a fair trial, but, if need be, they must seek authority to go farther.

M. Marlio recalled that the company had discussed co-ordination plans with passenger hauliers in several departments of the area served by the Eastern Railways. Co-ordination of rail and water transport had also been undertaken. The company hoped to see a substantial improvement in its operating account when the plans come into force. During the past year five new railcars had begun running and had given satisfactory results in competition with road motorcars. In order to meet goods competition, the company had arranged scales of reduced rates and contract prices. It had also introduced new methods based on maximum and minimum tariffs and subscription rates.

ARGENTINA

"Go-slow" Movement on B.A. & Pacific Railway

During the week March 18-23, traffic working on the B.A. & Pacific Railway was seriously interfered with by a "go-slow" movement among the outdoor staff. Ostensibly, the agitation originated in the company's refusal to remove to another post a fitter in the locomotive workshops at Mendoza, to whom some of the employees objected, his only offence being that he had declined to come into line with the union delegate. This pretext for starting the movement was so flimsy, however, that the company believes the cause to have been something other than that alleged by the men. The disturbance, which eventually involved practically the entire system, caused serious delays to the train services, particularly on the main line; the fruit trains from Mendoza and San Juan were specially hampered. The local services also suffered to a smaller extent.

At a meeting convened by the Director-General of Railways on

March 22, which was attended by the General Manager of the railway and the executives of both unions (Union Ferroviaria and La Fraternidad), proposals for finding a way to end the dispute were presented by both parties, and as a result of the conversations, the whole matter was settled, an undertaking being given by the "Union Ferroviaria" to stop the slow-working forthwith. The settlement arrived at does not represent any increased cost to the company, nor does it imply any new conditions of labour.

Unified Working between the B.A.G.S. and B.A. Western Railways upheld by Attorney-General

The co-ordination towards the end of 1933, with a view of reducing expenditure, of certain departments of the B.A.G.S. and B.A. Western Railways—details of which have already appeared in THE RAILWAY GAZETTE—was objected to by the railwaymen's unions, which apparently thought that some form of amalgamation was intended and feared that the proposed changes would result in many dismissals. They therefore lodged a protest with the Government against the scheme on the ground that it constituted a violation of Law 5315, which prohibits the transfer of a concession from one company to another or the leasing of any line by another concern without the authority of Congress, where, incidentally, questions were asked about it. In view of this, the Ministry of Public Works decided to obtain the opinion of the Attorney-General (Dr. Rodriguez Larreta), who has now given his decision. Dr. Larreta expressed the opinion that the unified system of train working in question did not involve a fusion of the respective administrations, nor did it in any way constitute a breach of the law referred to above. Both companies retained their separate individualities and independence; their accounts and receipts were not merged, and there was nothing whatever to suggest that the absorption of either concern by the other had taken place. Consequently, the Attorney-General considered that there were no grounds for objecting to the measures of co-ordination.

New Combined Rail and Road Passenger Service

A new departure in combined rail and road transport has been initiated recently in the shape of a joint working arrangement between the Villalonga Express Company, the B.A. Great Southern Railway, the Argentine State Railways, and a concern known as La Nueva Motor Company, for the operation of a passenger service between Buenos Aires, Puerto Madryn, Trelew and Comodoro Rivadavia, the site of the National Oilfields, in the southern territory of Chubut. The journey is made over the B.A.G.S.R. to Patagones, whence it is continued,

without changing carriages, by the State Railways to Puerto San Antonio, and thence by the motorcars of the above-mentioned road transport company. The service is a bi-weekly one, and the trains leave the Buenos Aires (Plaza Constitucion) terminus of the B.A.G.S.R. every Tuesday and Friday at 18.35. The first class single fare (inclusive of rail and motorcar) is \$113.65 paper, and second class, \$81.85. The distance from Buenos Aires to Comodoro Rivadavia is, approximately, 1,800 km. (1,116 miles): the time occupied on the journey is about 84 hr.

BRAZIL

Disputed Rescission of Companhia Ferroviaria Est Brasileiro Contract

The contract drawn up in April, 1930, between the Federal Government and the Cie. des Chemins de Fer Fédéraux de l'Est Brésilien for the operation of a railway system serving the States of Bahia, Sergipe and the northern part of Minas Geraes was rescinded by a decree in June, 1934, according to which the system automatically passed into the hands of the Federal Government and was re-named: Viação Ferrea Federal do Leste Brasileiro. When the time came for the Government to take over the administration of the company, the latter lodged a protest, through its legal representative, against the rescission of the contract, on the ground that the action of the Government was irrational and unconstitutional, alleging also unjust seizure of premises and property. The Federal justices in Bahia found for the appellants and ordered the immediate restoration of the railway and effects to the concessionary company.

This decision aroused the hostility of the employees, who were dissatisfied with the French administration, and a general strike resulted, paralysing traffic and seriously disturbing commerce for several days. The men were eventually persuaded to return to work, but, although an interpellation was issued by the Attorney-General (Procurador Geral) of the Republic, requesting the justices of Bahia to reconsider their order, the latter upheld the whole of their previous findings, with the result that an *impasse*, which, *prima facie*, can be cleared up only by arbitration, has been created, the railway remaining in Federal hands, although, *de jure*, belonging to the concessionaries.

New Outer-Suburban Services on the Leopoldina Railway

With the abolition of the transport tax on all single passenger fares up to five milreis (return fares up to ten milreis), the Leopoldina Railway proposed to the Government that this tax should be retained as part of the Rio-Petropolis fares, and that in compensation the company should (a) make all the Petropolis trains which hitherto called at intermediate stations non-stop between Barão de Mauá and Raiz

da Serra, and (b) run four additional stopping services each way between the two latter stations; this would serve the dual purpose of standardising all Petropolis train schedules on the basis of 1 hr. 40 min. (outward) and 1 hr. 35 min. (return), and satisfying the needs of the population in the outer-suburban localities.

It was calculated that an annual profit would accrue, even allowing for the running costs of the new stopping services and the adjustment in fares between Rio and all stations in the outer-suburban zone, such adjustment representing a compromise between the existing special fares and the very cheap suburban fares in force between Rio and Caxias. The profit would be assured by the retention of the transport tax, and the company could eventually use it to purchase railcars to supersede the outer-suburban trains.

The Government finally agreed to this proposal, and since April 21 all Petropolis trains have been running non-stop in each direction, with the exception of the unavoidable halts at the top and bottom of the *serra*. The daily number of such expresses on week-days was thus brought up to 15, with a total saving of 60 minutes; on Sundays and holidays the corresponding figures are 13 trains and 45 minutes saved. At the same time, the new outer-suburban services, worked by a small engine and two coaches, started to run between Barão de Mauá and Raiz da Serra. Owing to the difficulty of arranging paths in the busy stretch of line between Barão de Mauá and Caxias, two of the services in each direction start from and terminate at the latter station, connections being given from and to Rio by ordinary suburban trains.

U.S.S.R.

New Siberian Locomotive and Wagon Workshops

According to a Reuters message from Moscow, sites have now been selected for (a) new locomotive and wagon works at Kusnetsk and (b) wagon works at Krasnoyarsk, both in Siberia. The latter site has been chosen so as to be worked in conjunction with the heavy machinery shops at that place, which were begun in 1933, and both will be close together on the right bank of the Yenissei River; together they will employ 20,000 hands. The capacity of the wagon works is to be 10,000 a year. The Kusnetsk shops are expected to turn out 450 "FD" heavy goods locomotives, as well as 10,000 wagons annually, once production starts in 1938.

Completion of the Saratov Bridge over the Volga

The construction of a railway bridge at Saratov across the Volga, one of the big bridges of the world, has just been completed. Tracks are now being laid on the bridge and regular freight trains are expected to begin running across it

on April 15. Girder erection was finished on March 27. The delicate operation of transporting and raising the 800-ton span from the docks to a height of 20 m. (65 ft.) took three and a-half days. The work was finished under very difficult conditions of storm and frost, but the bridge had to be finished before the ice drifts started down the Volga.

MANCHUKUO

North Manchuria Railway Comes into Being

Manchukuo officials took over administrative control of the old Chinese Eastern and now North Manchuria Railway from the Soviet authorities on March 23. On the same date the Manchurian Minister of Communications read a ukase dissolving the Chinese Eastern Soviet-Manchukuo board of directors, which was then meeting for the last time. The South Manchuria Railway administration made an announcement shortly after the transfer that it would operate the newly-acquired lines for the Manchukuo Government and would consolidate the services of the North and South Manchuria systems with a view to increasing technical economic efficiency. The Far Eastern Press has it that following upon the conversion of the Hsinking-Harbin line, from 5 ft. 0 in. to 4 ft. 8½ in. gauge, by August next, the similar conversion of the eastern and western sections of the N.M.R., to Pogranichnaya and Manchouli respectively, will follow, probably by the end of the year, but there is no official confirmation of this report.

Rapid Improvement Forecast

One of the first results of the transfer—which is being carried out under the personal supervision of Mr. K. Usami, General Manager of the Manchukuo State Railways—is that on the Harbin-Manchouli line, or western section, of the N.M.R., a daily service of trains was started during the first week in April. Formerly there had been only three trains each way a week. Mails to Europe will thus be expedited by the obviating of one or even two days' delay at Manchouli. This is obviously only the first instalment of many improvements that will come into force almost at once. It is significant that 4,000 employees have been, or are being, transferred from the S.M.R. to the N.M.R., so that there will be plenty of new blood available to increase efficiency generally.

CHINA

Nanking Suburban Railway

The Kiangnan Railway, since taking over the operation of the existing Nanking City Railway, has decided to extend the line from Chungchengchieh station to the outskirts of the city at Wuting Men via Pafutang, Tashichieh, Yaochiaheng and Chinhuiho to serve rapidly growing suburban areas.

A Century Ago—Extracts from our First Issue

"An Account of the Proceedings of the Great Western Railway Company, with Extracts from Evidence given in support of the Bill, before the Committee of the House of Commons, in the Session of 1834."

A perusal of this Pamphlet, written avowedly as an explanation of the case of the promoters of the Great Western Railway, not only carries full conviction with it as to the course pursued by them, but strongly illustrates the value and importance of the general system of Railways.

The unhappy fate of the first attempt in Parliament to carry that measure, has in many respects led to a manifest

improvement in the designs, and has quite ensured the success of their present application for legislative sanction to the Bill. It seems to us impossible, after the extraordinary success in raising a Capital for the whole Line, notwithstanding the natural difficulties aggravated by the loss of their Bill last year, that the House of Lords should again reject a measure fraught with such important benefits to the West of England. The excellence of the Line is unquestionable,—having for 113 miles no inclination which exceeds 11 feet per mile. The greater portion is indeed under 6 feet per mile. A judicious step has been taken in making

a short ascent near Bath, not exceeding $2\frac{1}{2}$ miles in length at an inclination of 1 in 107, upon which locomotive engines can work, as on the Liverpool and Manchester Railway, by which arrangement a longer ascent, for nearly nine miles at 16 feet per mile, has been avoided.

One most important fact must not be omitted, as regards the present aspect of this Company in carrying their Bill through Parliament. The Land Owners on the Line have assented or are neutral for 90 miles, and the only dissents are upon 25 miles of the Road. In fact it is ardently desired by almost all who are not interested either in Canal Shares or Property similarly circumstanced. This ought and will have due weight with the Legislature, in looking to the merits of the measure.

Nor does this Railway seem to us to concern the City of Bristol *alone*. It is planned upon a far more comprehensive scheme, and the interest which attaches to it generally in the West of England, arises from the power and design of the Company to extend the Railway through the Towns of Gloucestershire, as well as into Devonshire, through Bradford, Trowbridge, and Frome.

The traffic must be very extensive, and we really do regard this undertaking as one of those most surely calculated to uphold the importance, and to exemplify the advantage and profit, to be derived from well-designed Railways.

* * * *

THE GREAT NORTHERN RAILWAY

A prospectus has been issued by this Company announcing an intended Railway from London to York. The different Committees are formed of many highly respectable and influential names, and the advantages which are set forth in the prospectus are obvious.

This Railway is intended to commence at Goulstone Street, Whitechapel, London, and proceed through Dunmow to Jesus Green, Cambridge. A branch from this Line may be extended to Colchester and Ipswich, giving those towns the double advantage of a direct communication with the Metropolis and the North of England. The Railway will then extend in an undeviating line from Cambridge to Lincoln, and pass near to Huntingdon, Ely, Peterborough, Wisbech, Market-Deeping, Grantham, Newark, and through Seaford. From Lincoln it will gently curve—passing near Gainsborough, Doncaster, Thorn, Snaith, How-

den, and through Selby to York. By a junction with the Leeds and Selby Railway, a perfect communication will be made with Leeds, Bradford, Halifax, Huddersfield, and the other great manufacturing towns in that district. Branch lines may, with great facility, be made to Nottingham and Sheffield.

The Line to Norwich will commence at Dunmow, and terminate at St. Faith's Lane.

It is further intended to extend the Railway from York to Carlisle. To this great line may be joined, the Stockton and Darlington, the Pickering and Whitby, and the Newcastle and Carlisle Railways; thus affording a most important mode of communication with the North-Eastern parts of Yorkshire. From Carlisle the Railway will be extended to Edinburgh and Glasgow, and at Moffat diverge in two branches, one through the valley of the Tweed, by Drumelzier, near Peebles and Eddlestone, and then unite with the Railway from Dalkeith to Edinburgh; the other branch will proceed from Moffat by Hamilton to Glasgow; and thus complete the great commercial line of communication between England and Scotland.

THE RAILWAY MAGAZINE.

No. I.

MAY 1st, 1835.

SKETCH OF THE

ORIGIN AND PROGRESS OF RAILROADS IN ENGLAND.

AND AN ATTEMPT TO SHOW

THE ADVANTAGES THAT MAY ACCRUE TO THE COUNTRY BY THEIR ADOPTION.

MANY relations of ancient history are sufficient to prove that the *principle* of the Railroad was not unknown at a very early period. We read of the transportation of heavy carriages like mead-lands and haycocks, across marshes

ONE HUNDRED YEARS OF RAILWAY PUBLISHING

A brief history of "The Railway Gazette" and its incorporated journals, "Herapath's Railway Journal," "The Railway Times," "The Railway News," "The Railway Engineer," &c.

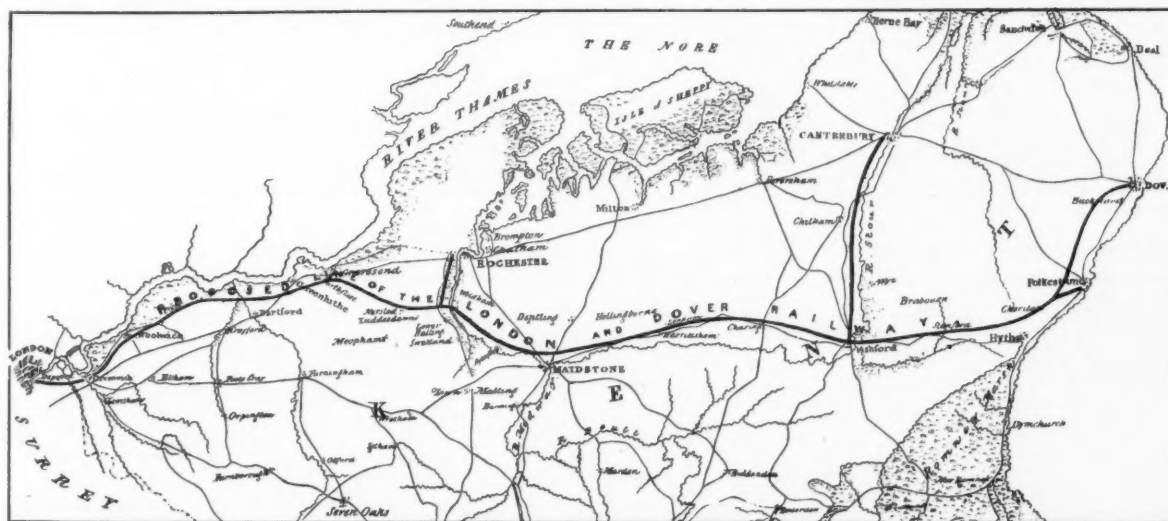
ON the eventful May 1 of 1835 when *The Railway Magazine*, the oldest of the journals now incorporated in THE RAILWAY GAZETTE, made its debut, the throne of England was occupied by William IV, and it is enough to say that he was also King of Hanover to emphasise the profound gulf which exists between those times and the present. The railway industry as we now know it was virtually at the beginning of its career as a carrying agent—previously it had been regarded as a species of highway which might be used by the vehicles of any carrier on payment of a toll. The use of steam traction quickly showed the impracticability of this conception and made it possible for bold spirits to visualise a nation-wide system. Some indication of this is to be found in remarks quoted in our first issue from a report of Henry Habberly Price, a civil engineer, who did much to promote the establishment of a London-Bristol railway, although his scheme was not the one which developed into the Great Western Railway. He said: *The railroad should not terminate at Bristol, but be extended, by means of a bridge over the Severn, into South Wales; nay, more, that the line of communication should be continued in Ireland, from Waterford to the banks of the Shannon. Railroads appear to me to afford the means of adding prodigiously to the strength of an empire from their power of concentration, and the rapid rate at which they may be passed over.*

Although such a vision appealed to the far-seeing few, the initial prospect of a large circle of readers for a railway paper cannot have been very bright, and we are compelled to admire the courage of our predecessors in launching their venture. In its original form *The Railway Magazine* was issued monthly and so continued during the ten months it remained under the control of its first editor. Then it was purchased by John Herapath, an engineer

who had already come into the public eye as the author of a regular series of articles on railways published in the *Mechanics' Magazine*, and was destined to become one of the greatest of the early figures in railway journalism. From its first issue *The Railway Magazine* had appreciated the need for technical articles, and as early as June, 1835, published a lengthy account of a report by Peter Barlow on "Experiments on the Transverse Strength and other Properties of Malleable Iron, with References to its Uses for Railway Bars." From March, 1836, the first issue produced by Herapath as editor and proprietor, increased attention was given to technical subjects, and the subtitle *Annals of Science* was added to the name of the paper. We find in May of that year a mathematical treatise on the "Effect of the Atmosphere in Resisting a Train," a subject of lively interest and still imperfectly understood.

Other features familiar to present day readers of THE RAILWAY GAZETTE which had their origin in the columns of 100 years ago are clear maps and line drawings—then produced on separate plates as engravings. A table showing the prices of railway shares first appeared in June, 1835, and has been continued without intermission ever since.

As soon as Queen Victoria came to the throne the first boom in railway shares began, and popular interest in railways took the turn of speculation. No longer was a monthly publication sufficient to record the frequent fluctuations of the stock markets and on Sunday, October 29, 1837, No. 1 of a new paper called *The Railway Times* made its appearance. At first it was produced at 6d. a copy in the size and form of a popular newspaper, its page being about 15 in. by 20 in. In this style it was cartooned (after the manner of Haydon's famous sketch of *The Times*) in the drawing which we reproduce. This shows a navvy anxiously awaiting his chance to



Good maps for their period were an early feature of "The Railway Magazine." The one reproduced above, from Volume I, shows a proposed mid-Kent course between London and Dover, following a greatly different route from that eventually adopted by the South Eastern Railway



WAITING FOR "THE RAILWAY TIMES."

(AFTER HAYDON)

A cartoon of the railway mania period

look at the latest railway share quotation and prospectuses, and is indicative of the extent of the railway mania when the whole country was steeped in wild speculation in railway schemes, many of which never materialised.

In 1845 there were very few advertisements of railway manufacturers, most of the advertisements being closely-set preliminary prospectuses of proposed new railway companies and notices of meetings. Below are the headings

Opposite we reproduce the first page of Supplement II of *The Railway Times* of October 4, 1845. This issue, although it retained its usual price of 6d., was published with two 32-page supplements, bringing the total pages up to 96, in order to accommodate the enormous number of railway prospectus advertisements. Nor was this an isolated example, and the railway mania of 1845 must have been a golden time for the railway press of the period. For example, the issue of September 6 of that year also had to come out in three parts, namely the main issue on Saturday, Supplement I on Monday, and Supplement II on Tuesday, although in this case the total of pages was only 80. All were eclipsed, however, by the issue dated September 27, which contained 112 pages (of which 77 were advertisements) and was issued in four parts. It was not uncommon to find notices like the following:—

In consequence of the extraordinary press of advertisements this week (notwithstanding we present our readers with a double supplement), we are compelled to omit several important railway meetings and communications from correspondents which we have in type, as also many advertisements. We hope to be able to clear off all arrears next week.

THE RAILWAY TIMES.



"LONG BACKS, BATHS, TALK, THERE ARE THOSE THINGS WHICH MAKE A NATION GREAT AND PROSPEROUS.—A FERTILE SOIL, BUSY WORKSHOPS, AND EAST COAST STAPLES FOR MEN AND COMMODITIES FROM ONE PLACE TO ANOTHER, TO WHICH, LET ME ADD KNOWLEDGE AND GREENHOOD."—Bishop Hall.

No. 1.]

SUNDAY, OCTOBER 29, 1837.

[PRICE 6d.]

CLASGOW, PAISLEY, and GREENOCK RAILWAY COMPANY.—Notice is hereby given, that the Directors of this Company, having resolved to prevent without delay the execution of the works, have this day made a C.I.L. of 3d. per share, to be paid on or before the 15th day of January next, to the amount of 10s. 6d. in full, with any one of the banks in Glasgow, with the National Bank in Edinburgh, with the Commercial Bank, in Liverpool, with the Lancaster Banking Company, in Lancaster, and with the chief office of the London and Westminster Bank, in Throgmorton-street, London.

And notice is hereby also given, that the original prospectus, whose names appear in the Parliamentary order of the said Company, will be registered as the existing prospectus of the shares, in respect of which they applied such undertaking, unless the holders of the scrip application for such shares claim to be registered as the proprietors of the same shares, and pay the said Call, on or before the said 15th day of January next.

And notice is hereby also given, that in every case in which the original prospectus shall be so registered, the return of the shares of every such prospectus, containing notice of the shares held by them, shall be made in due, at their own cost, in the mode required by Act of Parliament.

All persons having the above Call are requested to give notice to the Secretary of the Company.

On the 1st of December will be published in Imperial Quarto, price 1s. 6d., and Large Folio, with Proof Plates on India Paper (an unusually beautiful edition), price 7s. 6d., **SAUNDERS' PORTRAITS AND MEMOIRS OF THE MOST EMINENT LIVING POLITICAL ECONOMISTS.**

Edited by the Right Hon. JOHN GUNT BELMONT, Esq., M.P.

CHARLES MILLER, Esq., M.P.

JOHN ARTHUR HURD, Esq., M.P.

JOHN TEMPLE LEADER, Esq., M.P.

The Right Hon. LORD JOHN RUSSELL, M.P.

"The Works may fairly take its stand opposite to the Conservative Periodical."—*Observer*.

"In Liberator of all shades of politics we cordially recommend this publication."—*Observer*.

"The series of the Memoirs is evidently a very able man."—*Literary Gazette*.

London: Published by John Saunders, jun., 7, Dyer's Buildings, Holborn; and of whom a Prospectus, containing seventy FIFTY REVIEWS of the above Works, copied from the columns of the respectable Newspapers, has been sent to the Librarians, Booksellers, and Stationers, may be had.

In a closely-printed Vol., with many Colours, price 1s. 6d., **ACACIA OF SCIENCE, and ANNUAL REGISTER OF THE USEFUL ARTS, for 1837.**

A very useful, as well as entertaining, miscellany. It is certainly a cheap publication, and contains accounts of all the principal inventions which the past year has produced in Mechanics, Chemistry, Natural History, Zoology, Meteorology, Rural Economy, Gardening, and the other Arts, and practical Science. It is printed by Mr. John Lubbock, 145, Strand, of whom, also, may be had master volumes for the seven preceding years.

CHURCHING-CROSS HOSPITAL.—The Committee beg to return their grateful thanks for the assistance which they have received in support of the Hospital, and to express their sincere desire to meet the relief which it affords. They beg respectfully to refer to the published statement of the operations of the Churchoyng-Cross Hospital, and to add, that as the chief support is derived from the voluntary benevolence and contributions of the benevolent, they earnestly solicit the aid of the different in the land.

In-patients under care 1st January 1837 75

In-patients admitted from 1st Jan. to 31st Dec. 1836 100

A TRIP TO TRING.

Tring was, when Greenock or Grayswood turned the corner. There of a Cornish's wanderings. The adventures might who dared the perils of the ocean, and passed a day at Margate, looked, on his return, as he may imagine the monkey to have looked, who had seen the world. Now, however, all this is changed. On where you will, there will you find men born within the limits of my Lord Mayor's dominion; like Benbow, they are emigrants. May, some are held enough to attempt the trackless paths of the air, anxious of immortality and the "Gower's quest."

But for the less venturesome, who may nevertheless be infected with the mania for locomotion, the Railways offer an irresistible temptation. The blessings of all true citizens be on him who first brought Railways to their very doors! Henceforth let the haunts of civilisation be based on railways; for Railways have accomplished what the far-famed Society for the Diffusion of Useful Knowledge, with its long train of cables and ignominious parades, and its penny magazines and penny encyclopaedias, had not, could never, have effected: they have made a man a man, and a woman a woman, and a child a child, and a nation a nation, and a world a world.

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Facsimile of the first heading of "The Railway Times," the earliest weekly railway journal. Its page was originally newspaper size, about 15 in. by 20 in.

of some of the advertisements which make curious reading in these days:—

Tring, Reading & Basingstoke Railway.
Great Northern & South Wales and Worcester Railway.
London & Windsor Railway.
Rugby, Derby & Manchester Railway.
Scottish North-Western Railway.
Bristol & Dover Direct Junction Railway.
Lyons & Avignon Railway.
Manchester & Southampton Railway.
Liverpool & Leeds Direct Railway.
London, Bristol & South Wales Direct Railway.
Great Western Extension Atmospheric Railway.
Great Welsh Central Railway.
Midland & Thirsk Junction Railway.
Lanarkshire & Lothians Direct Railway.
Great European Railway Company.
London Central Railway Terminus Company.

When the railway mania passed these palmy day disappeared never to return. For example, the issue for July 21, 1849, contained only 24 pages, of which but 3½ were advertisements.

As *The Railway Times* is now also incorporated in THE RAILWAY GAZETTE, we may justly claim continuity of weekly publication since October 29, 1837. The earlier paper did not intend to be left behind, and on August 17, 1839, was transformed from a monthly octavo magazine to a weekly quarto newspaper as *The Railway Magazine and Commercial Journal*. Already it was popularly referred to by the name of its editor, but the word "Herapath" was not officially attached to the title until January 2, 1841, when the engineering leanings of the paper were again asserted by the addition of the words "and Scientific Review."

A chronological table which we reproduce opposite sets forth not only the names and dates of the various periodicals now incorporated in THE RAILWAY GAZETTE, but also indicates the progress of amalgamation, so that it is unnecessary to detail them here.

The rapid increase in the number of British railways and particularly the railway mania of 1845 brought many other railway papers into the field. The following list of former railway periodicals (other than those now incorporated with THE RAILWAY GAZETTE) is taken from "The Times Handlist of Newspapers":—

Railway Advocate	Railway Herald
Railway Argus	Railway Intelligence
Railway Bell	Railway King
Railway Chariot	Railway Messenger
Railway Chart	Railway Miscellany
Railway Chronicle	Railway Notes
Railway Courier	Railway Press
Railway Critic	Railway Reformer
Railway Director	Railway Register
Railway Engine	Railway Shareholder
Railway Examiner	Railway Standard
Railway Express	Railway Telegraph

Most of the journals had only a brief existence, but for a number of years there were three prominent and prosperous weekly journals associated with the British railway industry, namely, *The Railway News* (founded in 1864), *The Railway Times*, and *Herapath's Railway Journal*. These were largely financial papers and derived much of their revenue from official notices and reports of the railway companies' meetings, which were then held half yearly. But this was a constantly diminishing source of revenue consequent on the merging of the small lines into larger companies. In the quarter of a century between 1850 and 1875 more than 1,000 British railway companies had been reduced to 247. Moreover, many of these were but branch lines of local creation worked by a larger company, and only 24 companies owned or worked more than 150 route miles, only 16 over 300 miles, and only 8 over 600 miles.

The first purely technical modern railway periodical to

make its appearance was *The Railway Engineer*. When No. 1 was issued in February, 1880, an introductory leader under the heading "The Reason Why" set forth its intentions and scope in the following terms:—

To provide ample space and opportunity for exhaustive reviews on matters relating to railway engineering, and

To build up, page by page and number by number, a work of reference, which, by the aid of copious subject indexes, will ultimately become the encyclopædia of the profession.

At that time the need for such a specialised paper was great, for the weekly railway Press was concerned mainly with finance and, to a lesser degree, with operating matters. *The Railway Engineer* was a pioneer in its appreciation of the importance of the engineering and manufacturing sides of railway activity, and of the value to progress which was to be secured by the accurate ventilation of both developments and problems. The policy laid down in the first number throughout guided the contents of subsequent issues, and the volumes for 55 years testify to the measure of success it achieved. An outstanding feature was always the high standard of line drawing used to illustrate descriptive articles. For many years all drawings were produced by staff draughtsmen in accordance with the style which experience showed to be most suited to the particular need of the railway engineer.

Within more recent years two notable changes have taken place in the weekly railway Press, namely, increasingly detailed attention has been paid to engineering matters, and the process of amalgamation (coincident with the merging of British railway systems into the present four groups) resulted in the emergence of THE RAILWAY GAZETTE as one strong and representative weekly journal comprising the best features of the many erstwhile competitive weeklies. On April 3, 1914, THE RAILWAY GAZETTE and *The Railway Times* were amalgamated, and almost simultaneously the then competitive *Railway News* completed its own series of absorptions by taking over *The Railway Official Gazette*. Towards the end of the war it was realised that with the greatly changed conditions and impending reduction in the number of home railway systems a professional railway journal could be successful only by having the world for its sphere, and dealing with matters concerning management, engineering, and operation as affecting overseas, as well as home railways; the great railway systems of India, Africa, Argentina, Australia, and the Crown Colonies having achieved an importance equal to those of Great Britain. The process of railway amalgamation in Great Britain which resulted eventually in 1923 in the merging of 120 of the remaining English, Scottish, and Welsh companies into the four group railways was anticipated at the end of 1918 by the railway Press when THE RAILWAY GAZETTE effected a merger with *The Railway News*.

A stage further in the amalgamation process was reached in 1919 when *The Railway Engineer* came under the control of the proprietors of THE RAILWAY GAZETTE and the late Mr. S. Richardson Blundstone, Wh.Sc., who had been Editor and principal proprietor since 1889, retired. At that time *The Railway Engineer* came under the same editorial direction as THE RAILWAY GAZETTE, and the co-operation between the two papers was both intimate and mutually beneficial. At the beginning of this our century year complete fusion took place, after long and careful consideration, in order to supply the modern railway industry with the trade and technical journal most suited to its needs.

THE
RAILWAY MAGAZINE
MONTHLY OCTAVO:
MAY, 1835

THE
RAILWAY MAGAZINE
AND
COMMERCIAL JOURNAL
WEEKLY QUARTO:
AUGUST 17, 1839

HERAPATH'S
RAILWAY MAGAZINE
COMMERCIAL JOURNAL
AND
SCIENTIFIC REVIEW
JANUARY 2, 1841

HERAPATH'S
RAILWAY COMMERCIAL
JOURNAL
JANUARY 5, 1843

Herapath's
Railway
Journal
JANUARY 5, 1894

The Railway Times
OCTOBER 29, 1837

Chart showing the process of amalgamation of
the journals which are now incorporated in
"The Railway Gazette"

(The dates indicate the first issue of each periodical, or the
first issue under a changed title; those at the junction of two
lines are the dates of first publication following a merger)

THE
RAILWAY RECORD
APRIL 13, 1844

The Railway News
JANUARY 2, 1864

RAILWAY FLY SHEET
APRIL, 1870

THE
RAILWAY OFFICIAL GAZETTE
JANUARY 14, 1882

TRANSPORT
JULY 1, 1892

TRANSPORT
AND
RAILROAD GAZETTE
JULY 8, 1904

THE
RAILWAY GAZETTE
JULY 21, 1905

RAILWAYS
ILLUSTRATED
JANUARY 10, 1908

SEPTEMBER 7, 1901

MAY 23, 1908

JULY 4, 1914

APRIL 3, 1914

THE
RAILWAY GAZETTE
AND
Railway News
DECEMBER 6, 1918

JANUARY 18, 1935

THE
RAILWAY GAZETTE
A Journal of Management, Engineering and Operation
INCORPORATING
Railway Engineer • TRANSPORT • The Railway News
The Railway Times • Herapath's
Railway Journal • RAILWAY RECORD.
RAILWAYS • ESTABLISHED 1835 • THE RAILWAY OFFICIAL GAZETTE

Railway Engineer
FEBRUARY, 1880

PASSED TO
CONTROL OF
THE
RAILWAY GAZETTE
1919

DECEMBER 26, 1903

THE HORSE-POWER OF LOCOMOTIVES—ITS CALCULATION AND MEASUREMENT—II

By E. L. DIAMOND, B.Sc. (Eng.), A.M.Inst.C.E., A.M.I.Mech.E.

This is the second of a series of articles giving a critical account of the work that has been done in various parts of the world on a subject that today has acquired a new importance in view of the competition between the steam locomotive and other methods of railway traction. The first article appeared in our issue of April 12.

Dalby's Study of the Mean Effective Pressure.—In 1905, Professor W. E. Dalby made the first important contribution* in this country to the scientific study of locomotive performance since D. K. Clark, half a century before. Professor Dalby based his study primarily on Dr. Goss's test data from the locomotive *Schenectady*, but whereas Dr. Goss had himself examined the figures on the basis of hypothetical maximum output, irrespective of cut-off, but for an assumed constant rate of evaporation, Professor Dalby plotted the mean effective pressures at constant cut-off on a basis of piston speed, and found they lay on a straight line represented by the equation

$$p = c - bv$$

where p is the mean effective pressure, v is the piston speed, and c and b are constants for the particular engine and cut-off. This gives a parabolic curve for indicated horse-power (Fig. 2, page 693, April 12 issue) and the maximum indicated horse-power can be shown to be

$$\text{i.h.p.} = \frac{c^2 a}{132,000b}$$

where a is the area of the pistons in square inches. Professor Dalby checked his approximation against some independent results obtained on a testing plant belonging to the Chicago & North Western Railroad, and found good agreement between the limits of 400 and 1,200 ft. per min. piston speed. Moreover, he found that the constant c , which is equal to the hypothetical mean effective pressure at zero piston speed, when no wiredrawing of the steam takes place, coincided quite closely with the theoretical mean effective pressure for the corresponding cut-off. The complete horse-power curve for that cut-off could therefore be derived if only one indicator diagram taken at a piston speed of about 800 ft. per min. were available.

Now it will be observed that while Professor Dalby's horse-power curves are equivalent to Desdoutis' in their manner of derivation, except that Desdoutis' are less by the power absorbed in internal machine friction, Desdoutis was content to plot his actual observations, whereas Professor Dalby sought to establish a generalised rule and obtained a simple parabolic curve. Although he did not expressly comment on the point, he also extrapolated his curves to zero mean pressure at high speed, and hence indicated a limit to engine performance independent of the boiler. The piston speed at which this limit was reached was approximately the same at all cut-offs and was about 1,400 ft. per min. for a locomotive with 5 ft. 3 in. driving wheels, equivalent to 60½ m.p.h. This is, as a matter of fact, considerably below the speed which such a locomotive could attain, so that not much importance can be attached to the high-speed portions of these curves.

Von Richter's Formula (1906).—A new attempt to establish a formula for horse-power was made in 1906 by

M. von Richter, an Austrian. In a paper before the Verein deutscher Ingenieure,* discussing some new German locomotives, von Richter referred at some length to the performances of the de Glehn compounds of the Northern Railway of France, and commented very unfavourably on the relatively low speeds of the best German trains of that day, despite heavy supplementary fares, light loads, and in many cases easy grading. Like our own Great Western Railway, the Prussian State Railways acquired several de Glehn compounds, modelled on the Nord type, and von Richter referred to the French formula then current for calculating an average value of the horse-power, namely,

$$\text{i.h.p.} = 20 \sqrt{G \cdot p \left(H_f + \frac{H_t}{3} \right)}$$

This formula, he remarked, did at any rate relate the horse-power to the effective dimensions of the locomotive, namely, G the grate area (square metres), p the boiler pressure (atmospheres), H_f the firebox heating surface (square metres) and H_t the firetube heating surface (square metres), and was also logical in that it gave a much higher value to the firebox than to the tube heating surface. But, of course, it gave no indication of the power to be expected at different speeds. In the case of the particular locomotive considered it gave a value of 970 h.p. In actual performance the greatest horse-power reached was about 1,450, but usually the power did not exceed 1,000 h.p., nor even 800 h.p. Von Richter then referred to Frank's formula and its ever-increasing value, and suggested that the proverb *Es ist dafür gesorgt, dass die Bäume nicht in den Himmel wachsen* is true also in the realm of locomotive performance. He therefore proposed instead the formula

$$\frac{N}{H} = 0.1 \left(a - \frac{n}{b} \right) \sqrt{n}$$

where N and H are horse-power at the rim of the driving wheels and the total heating surface respectively, as in Frank's formula, a and b are constants, and n is the speed in revolutions per minute. He admitted that this formula did not discriminate between the firebox and tubular heating surface, but considered that for values of the ratio H_t/H_f from 8 to 13, it is not seriously affected by this. In two important respects the formula represents an advance: first, it gives a maximum, at a value

$$n' = \frac{ab}{3}$$

below and above which the power falls off, and in the second place it is based on the speed of revolution of the driving wheels and is thus independent of their diameter. Von Richter gave values of the constants a and b for various types of locomotives, including locomotives with superheaters, and some of his curves are reproduced in Fig. 3 on page 694 of the April 12 issue. It is remarkable that he assigned such a relatively high power to the superheater compound locomotive. Nordmann subsequently pointed out† that such an increase over the values for a superheater simple locomotive was

* Z.V.D.I., 1906, p. 554.

† *Glasers Annalen*, 1911, vol. 69, p. 240.

* Proc. Inst.C.E., 1905, vol. 164, p. 329.

excessive. His formula gives, however, exaggerated results for all types of locomotives.

Frank's Theoretical Formula (1908).—Professor Frank, in a communication published with von Richter's paper, defended his formula, on the ground that it held good over the range of conditions within which a locomotive customarily worked, and a year or two later endeavoured to support its validity by means of further experimental results.* This later paper† of Frank's is, however, chiefly of interest because in it he attempted also to establish on a theoretical basis a formula giving the horse-power in terms of the speed and the chief dimensions of the locomotive. Frank based this formula on the theoretical tractive effort of the locomotive at starting, adding and subtracting variable quantities to represent the different factors coming into play at speeds above the critical at which the boiler fails to supply the steam necessary to maintain the full tractive effort. This critical speed he gave as

$$V_1 = \frac{A\sqrt{RH}}{T}$$

where R is the grate area and H the heating surface in square metres, V_1 is the critical speed in kilometres per hour, T is the load on the driving wheels in tons, and A is a coefficient which he estimated as 4.133 for a 0-6-0 goods locomotive, 4.056 for a 2-4-0 passenger locomotive, and 3.985 for a 4-4-0 express compound locomotive. Up to this speed the rated tractive effort formula was to be applied. Above it, Frank assumed that the steam production increased directly as the speed. He also supposed that it would vary as the logarithm of the boiler pressure and as the product of the grate area and the square root of the heating surface for different locomotives, assuming that "the utilisation of the fuel is, for the same grate area, the more favourable the greater the heating surface."‡ The influences tending to reduce the power of the locomotive were first, the resistance to flow of the hot gases through the boiler tubes, which he supposed to be dependent on the square of the speed, the length of the smoketubes, and the inverse of their internal diameter. This would require the subtraction of a factor depending on the cube of the speed in the power formula. Second, there was the reduction in performance due to throttling through the regulator and at admission.§ This he supposed to vary with the square of the speed and inversely as the logarithm of the boiler pressure. But to allow for increased priming at higher rates of steam consumption (the formula was intended, of course, for saturated steam locomotives) the total loss was made to depend on the cube of the speed, thus also conveniently simplifying the formula.

Although of no value to-day, some attention has been devoted to Frank's theoretical formula because it indicates the general lines which most theoretical discussions of the problem followed, and at the same it will perhaps, in the light of what follows, reveal the great difficulties of approaching the problem on these lines without first an accurate knowledge of the factors affecting locomotive performance such as is not yet available, and second a much more uniform application of that knowledge in the shape of universally accepted rules of good design.

Each of the factors in Frank's formula was, of course,

* *Glaser's Annalen*, 1907, vol. 61, p. 233.

† It was translated into English and printed in the Bulletin of the Int. Railway Congress, 1908, vol. 22, p. 1116.

‡ *Glaser's Annalen*, 1908, vol. 62, p. 15.

§ Frank, like other theoreticians, ignored the much more important loss due to throttling at exhaust.

accompanied by an experimental constant, and such agreement as Frank found between his curves and actual test results was dependent on his choice of values for these constants. Indeed, since for every type of locomotive extensive experimental results are necessary in order to establish these constants, there appears to be little advantage in using the formula in place of the experimental results. Frank's idea was that formula and test should check each other, and for this there is some measure of justification when ordinary road tests are made, in view of the uncertainty that any individual test result represents the maximum or any specified proportion of the locomotive's output, but the constants in a theoretical horse-power formula of this type should really be based on fundamental experimental results relating to the individual factors in the formula, applicable to all locomotives of normal design.

Work of Strahl.—Richter's formula was immediately taken up by Strahl, who in 1908 published* a long series of articles entitled "Die Anstrengung der Dampflokomotiven," subsequently followed by many other valuable studies of this and kindred problems which entitle him to a high place amongst locomotive engineers. The particular value of the articles cited lay in the fact that instead of advancing a formula or theory and assembling his facts around it, he was content to discuss the various factors influencing locomotive performance from a critical point of view. For instance, he discussed at length the question of the ratio of the heating surface to grate area, and appraised very shrewdly the value, or lack of value, of the hitherto widely accepted criterion that the greater this ratio the higher the boiler efficiency. The facts are, of course, well enough known to-day, but it will be evident from what has already been written that at that time there was much confusion of thought on the subject, which was a hindrance to the more exact knowledge of locomotive horse-power.

Strahl started from the basis that a locomotive boiler can normally evaporate a certain maximum quantity of steam, which is directly dependent on the grate area, but practically independent of the calorific value of the fuel (since the quantity of air required for the production of the same total amount of heat remains practically the same), and of the heating surface (since the efficiency of the boiler is only affected to an increasingly small degree by increase of the ratio of heating surface to grate area). He gave as an average figure for the maximum rate of evaporation 3,500 kg. of steam per sq. metre of grate area per hour (equivalent to 716 lb. of steam per sq. ft. of grate area per hour), and pointed out that the hardness, size, and weight of the fuel would affect this figure more than its calorific value. The actual quantity of steam generated depends, within the limits set by this maximum value, on the quantity of air drawn through the grate, that is, on the pressure in the blast pipe, which, in turn, is dependent on the quantity of steam used. Strahl satisfied himself on this point by removing the valves from a locomotive and studying the effect of varying the regulator opening, the steam passing directly through the steam chest to the blast pipe and chimney. The maximum quantity of steam generated corresponds to a maximum steam consumption, but is independent of whether this consumption is at a low speed and late cut-off, or at a high speed and early cut-off, except in so far as the boiler efficiency is affected thereby.

At the speed at which any locomotive is primarily designed to run there is, however, a limited range of cut-off at which the steam supplied is used to the best advantage, and Strahl postulated that this speed and cut-

* *Organ für die Fortschritte des Eisenbahnwesens*, 1908, p. 337.

off also corresponds to the maximum evaporative performance of the boiler, and hence demanded a definite relationship between the cylinder volume and the grate area. Any serious deviation from this relationship must result in a reduction of the maximum horse-power of the locomotive, and Strahl claimed that such a criterion was an essential condition in any horse-power formula such as Richter's. His criterion is given by

$$n' = C \frac{R}{J}$$

where n' is the number of revolutions per minute at the most favourable speed, R is the grate area in square metres, and J is the volume in cubic metres of one cylinder of a two-cylinder simple locomotive or one low-pressure cylinder of a four-cylinder compound locomotive. He arrived at the essential factor C by extensive study of available test results and gave it the following values: 11 for saturated steam simple-expansion locomotives, 12 for two-cylinder compound locomotives, 13 for four-cylinder compound locomotives, and 15 for superheater simple-expansion locomotives. Subsequent experience has proved that Strahl's criterion is invalid, since the hypothesis regarding the most favourable speed on which it is based does not correspond to reality.

Strahl also commenced at this time his study of the losses of power in the cylinder, especially due to throttling at admission, and their effect on the mean effective pressure. In his 1908 articles, however, he expressly stated that his theoretical discussion of the problem could not be sufficiently exact to be capable of application to calculations for specific cases. He claimed only that it would help to give a clearer picture of the general effect of throttling and its influence on the use of the steam supplied by the boiler. He carried these studies much further, however, during the following years, and eventually published a book on the subject, to which reference will be made towards the end of these articles.

EARLY EXPERIMENTAL WORK

Germany.—In order to appraise the value and to realise the limitations, particularly of the German work of which an account has been given, it is necessary to consider the experimental data available at the time. For, despite the attempts which were being made to place the estimation of locomotive horse-power on a theoretical basis, it is evident that ultimately actual values were in all cases derived from practical test data. This was in a sense a golden age for the theoretician of a type especially characteristic in Germany, and this fact possibly accounts for the predominance of German work during this period. Discourses* on locomotive performance were composed on the assumption that given a couple of experimental results to start from, theory would do the rest. The experimental results available were insufficiently exact or numerous to reveal what in the light of these theories could only have been regarded as hopeless inconsistencies.

Most of the earlier German work was based on a series of locomotive trials carried out at the beginning of the eighties of last century at the instigation of the Prussian Minister of Public Works.† These trials were designed to determine the maximum performance of three standard locomotives at different speeds on different gradients. No dynamometer car was available, however, and the work of the locomotive was estimated by means of Clark's train resistance formula based solely on the weight and speed

of the train. Frank subsequently attempted to estimate the resistance more accurately, but had to make assumptions regarding the composition of the trains as the weights only were given in the published data. In these circumstances it is not difficult to understand how he could have arrived at so simple a power formula and retained so much faith in it.

Further tests were carried out in Germany from time to time, some of which Frank himself made use of. Generally they merely provided the information that such and such a locomotive hauled a train of such and such a weight between two given points at a certain speed. The necessity of uniform conditions was realised, however, and it was usual to select data which could reasonably be supposed to relate to steady performances. The extreme difficulty of securing really uniform conditions, even for a limited period, in an ordinary road test, was not realised at that time, and in reality the data used were so unreliable and the assumptions made so wide that almost any theory could be supported by the available test results.

America.—Probably the greatest activity in locomotive testing, then as at a later period, was in America, so much so indeed that a joint committee of the American Society of Mechanical Engineers and the American Railway Master Mechanics' Association was formed to report on Standard Tests of Locomotives.* But this testing was almost all comparative in character, largely due to the advent of the compound locomotive. The committee's report therefore was designed only to ensure that the conditions in a comparative trial should be the same as between the individual runs, so that the fuel consumptions measured, which the railway managements were mainly interested in, should be truly comparable. No rules were laid down to govern the conditions under which measurement of power should be made and no attempt was made to suggest methods by which absolute measurements of performance could be made under constant conditions.

England.—In England the results of several series of locomotive tests were published, notably by Adams and Pettigrew† and by W. M. Smith,‡ a dynamometer car having been used in the latter case in conjunction with the taking of indicator diagrams. W. M. Smith's tests were carried out "to obtain an idea of the fitness of five different classes of express passenger locomotive engines to perform a given duty," but the governing conditions in this, as in most contemporary trials, was to adhere as carefully as possible to a pre-arranged schedule time, the working of the engine being left to the driver's discretion. The data given included particulars of the drawbar and the indicated horse-powers on various gradients at particular moments, but in view of the continually varying conditions and the absence of any separate determination of the internal resistance of the locomotive, it is scarcely surprising that an editorial article in *The Engineer*§ commented on the results as follows: "We have only to examine with care the tables and diagrams . . . to appreciate the futility of the whole thing . . . The attempt to deduce any law or co-ordinate any facts would lead to lunacy. We encounter every moment the most baffling contradictions. The inconsistencies are amazing; the incompatibilities perplexing."

* See Proc. Am. Rly. Master Mechanics Assocn., 1893, vol. 26, p. 22.

† Proc. Inst. C.E., 1895, vol. cxxv, p. 282.

‡ Proc. I.Mech.E., 1898, p. 605.

§ *The Engineer*, 1898, vol. 86, p. 449.

* See, for example, Obergethmann, *Glasers Annalen*, 1909, vol. 64, p. 228.

† *Organ für die Fortschritte des Eisenbahnwesens*, 1887, p. 103.

THE NEW LEICESTER SQUARE STATION

The completion of the new sub-surface multiple-entrance station of the London Passenger Transport Board at Leicester Square concludes the programme of modernisation of all the important stations of the underground railways in the central London area

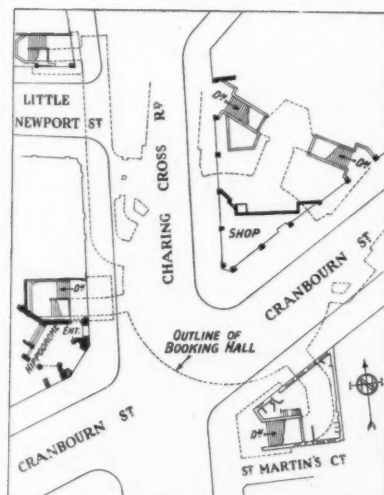
THOSE who habitually use the London streets have grown so accustomed to the slow progress and frequent stoppages of vehicular traffic as scarcely to notice any slight aggravation of these conditions here and there. For the past four and a half years there have been obstructions in the roadways adjoining Leicester Square station, which have appeared to the majority of passers by as merely one more impediment to rapid transit. Little thought have such persons given to the revolution which was proceeding beneath their feet and with so small a disturbance of their normal activities. To say that 34,000 cu. yd. of earth have been removed, and a million bricks, 7,000 cu. yd. of concrete, and 4,500 tons of steel and iron put in, is to give only the faintest idea of the intricacies of the work which has gone to the provision of one of the most up-to-date, convenient and attractive railway stations in the metropolis.

The old Leicester Square station, opened in 1906, could not claim any of these qualities, and few of the 27,000,000 persons who use it in the course of a year will regret its replacement by a station which will save them precious minutes in their daily travelling and cheer them on their way.

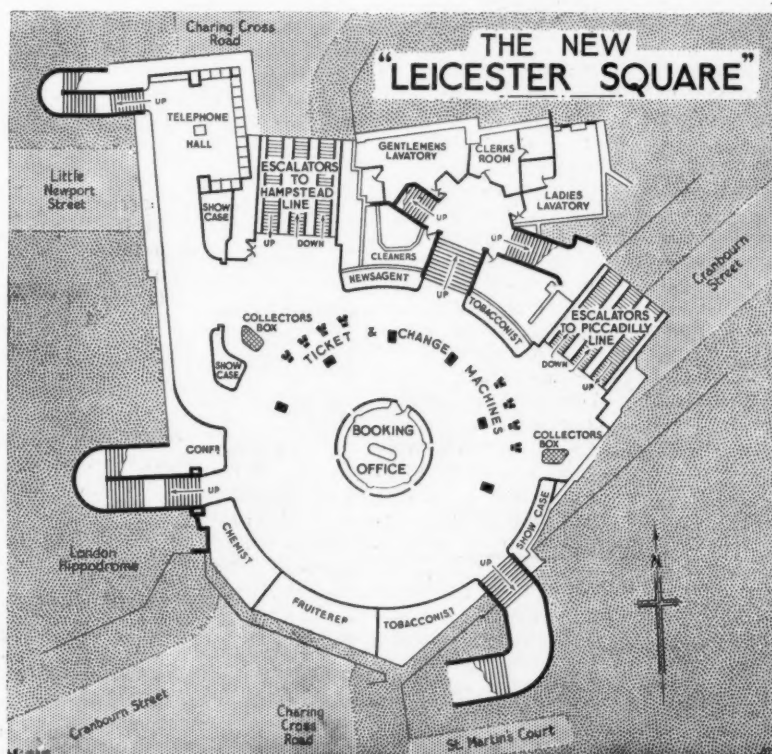
The aim of those who administer the railways of the London Passenger Transport Board is to minimise the delay to passengers between street and train, and the new Leicester Square station achieves this to the maximum extent. Under the junction of Charing Cross Road and

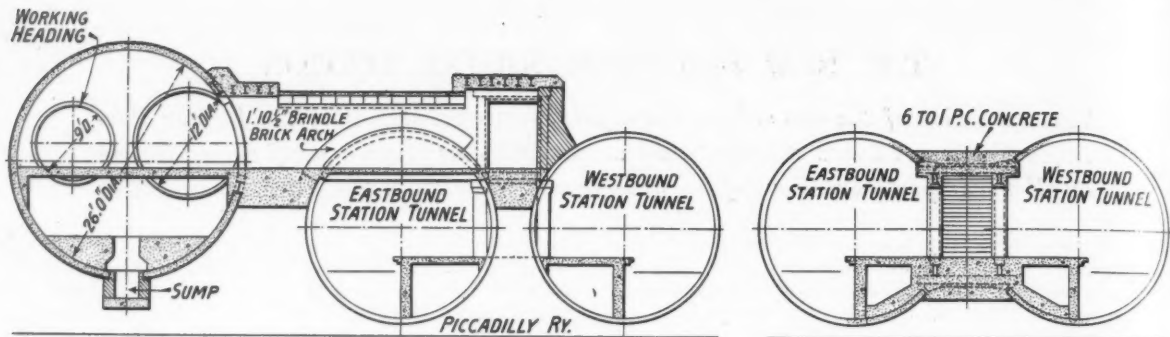
Cranbourn Street is a large circular booking hall, amply equipped with ticket machines and booking booths, to which access is obtained from five street entrances. Two escalator tunnels descend, one to the Piccadilly Line platforms and the other to those of the Hampstead tube. Round the booking hall are shops and show cases, and adjacent to it a telephone hall and lavatory and cloak room accommodation (the latter still to be completed). The whole area is brightly lit and cheerfully panelled and gives no idea of the ingenuity and toil which went to its construction.

The first stage in the work, which was begun in October, 1930, was the underpinning of part of the existing station building, the foundation of which was on a concrete raft, and of certain other adjacent buildings; the construction of two new pipe subways and the diversion thereto of cables and mains; and the diversion of three important sewers. Immediately underneath the surface of Charing Cross Road there was an old London County Council brick arch pipe and cable subway, and it was to replace this, where it crosses the site of the new station, that one of the new pipe subways was constructed at a considerably lower level. Connection at each end of the new subway has been made to the old L.C.C. subway by inclined shafts. The second new pipe subway was constructed beneath Cranbourn Street, and is at a lower level than that under Charing Cross Road, with which it connects at its intersection. At each end of the Cranbourn

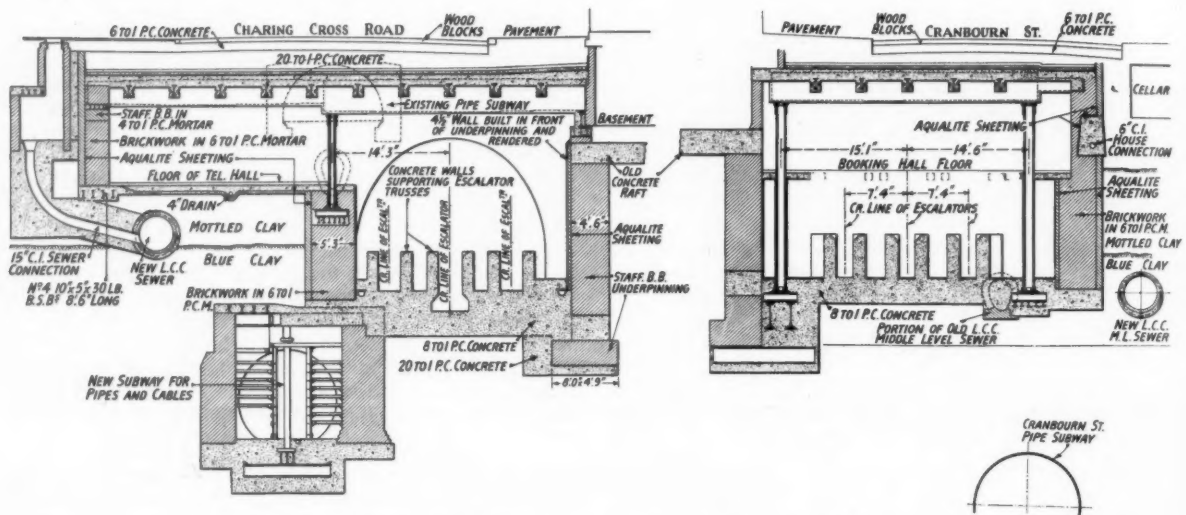


Diagrams of Leicester Square tube station showing (above) street level and detail of entrances to underground booking hall (right)

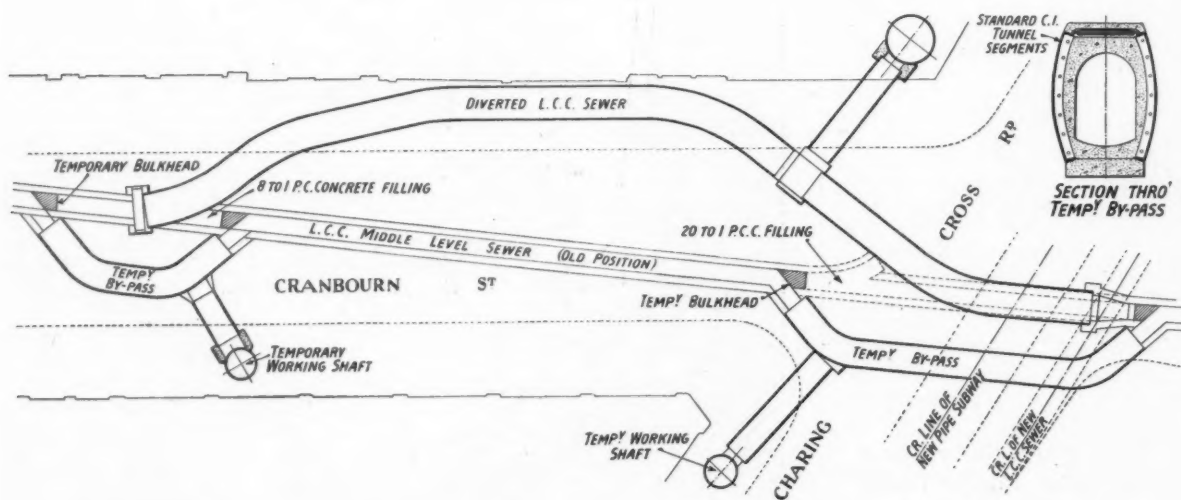




Cross sections showing (left) passage from escalator, cutting across platform tunnel to top of stairway, and (right) stairway to platform in steel frame



Cross sections through Charing Cross Road (left) and Cranbourn Street (right) showing diverted sewers, pipe subways, escalator machinery chambers, foundations, and strata

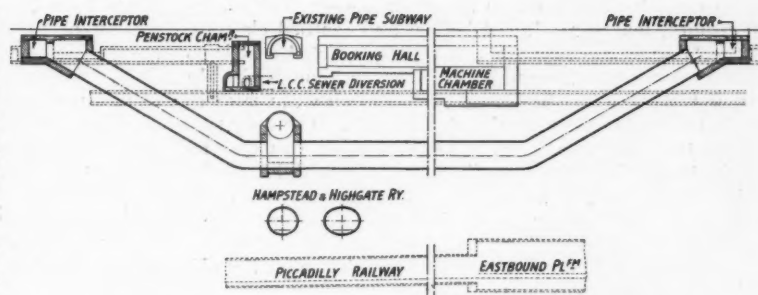


Drawing showing method of diverting sewer. Standard cast iron tunnel segments were used for the temporary headings

Street pipe subway there is an inclined shaft to an intercepting chamber immediately below the road surface into which all the various pipes, mains and cables under the roadway were concentrated. The new pipe subways were constructed of standard cast iron tube segments strengthened by brindle brick rings where heavy loads come upon them. The various service pipes and cables for supplying adjacent buildings with light, heat and water had also to be diverted so as to clear the roof of the new sub-surface station. Our illustrations give an idea of the kind of work which had to be undertaken, and reference to the drawings and photographs will elucidate the description which follows.

On completion of this preliminary work the ground immediately beneath the streets was available for the main work to proceed. Headings were driven under the roadways for the construction of the walls encompassing the outside area of the new booking hall and for a large part of the two machinery chambers for the escalators to the Hampstead and Piccadilly Lines respectively. One of the headings for these walls was driven from a basement under the old station, but it was necessary to sink a 6 ft. shaft on the west side of Charing Cross Road for the others.

The roof steelwork of the booking hall which supports the roadway at the junction of Charing Cross Road and Cranbourn Street is of spider's web design, and pits had to be sunk for the columns to carry the girders. The old L.C.C. pipe subway came in useful for the sinking of some of the pits for the column foundations. Although half the width of the street surface was given over to the con-

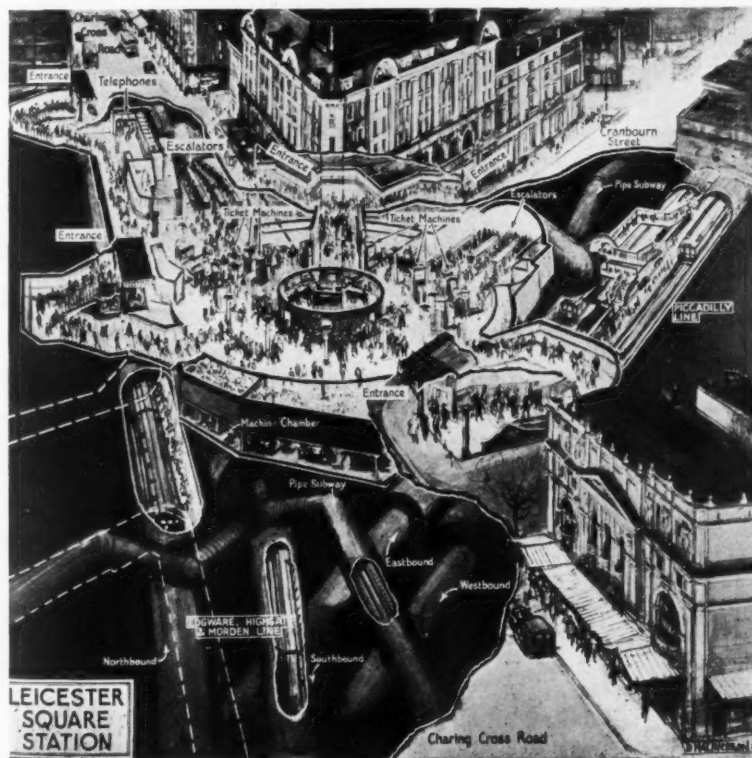


Longitudinal section through Cranbourn Street showing new pipe subway

tractors, it was necessary at the same time to carry out a considerable amount of work under the other half over which the traffic was passing. The spider's web design of the roof necessitated the driving of headings under this half, and as a precautionary measure rail grids were put down on the surface by removing the wood block paving. For these grids 40 lb. rails were used, covered with asphalt, to form a temporary road surface. Although some of the girders were placed in position in the headings, it was not possible to erect the supporting columns for their outer ends then. This made it necessary to provide temporary supports until one side of the roadway was reinstated, the traffic diverted to it, and the other half opened up. After the fixing of the roof and its supports, excavation for the escalator machinery chambers and the new booking hall proceeded apace.

Construction of the escalators—which replace the old lifts—and the new connecting passages from them to the platforms, was undertaken from two 9 ft. tunnels, one 20 ft. lower than the other, driven underneath Great Newport Street from a 12 ft. shaft on the site of a new substation near the corner of Upper St. Martin's Lane and Long Acre. From the upper tunnel the Hampstead Line escalator shaft was driven, and from the lower the shaft for the Piccadilly Line escalator. The Hampstead escalator shaft is 117 ft. 6 in. long and has a vertical rise of 58 ft. 9 in. The Piccadilly escalator shaft, which is the longest escalator shaft in the world, is 161 ft. 6 in. long and has a vertical rise of 80 ft. 9 in. Both shafts are 22 ft. 9 in. diameter and contain three reversible escalators so that two may work in the same direction, according to the direction of the main flow of passengers. Owing to the closeness together of the platform tunnels the staircase from the connecting passages at the bottom of the escalators to the platforms had to be constructed in steel frames, replacing the cast iron tunnel segments.

The 9 ft. tunnel used for construction of the Hampstead Line escalator shaft is now used as a cable tunnel between the substation and the Hampstead Line, connecting hereto by 7 ft. branches. Another 7 ft. cable tunnel has been built from the bottom of the 12 ft. substation shaft to the Piccadilly Line. All the tunnelling was carried through the London blue clay except near the upper end



Diagrammatic sketch of the new Leicester Square station

of the escalator shafts where the strata consisted of made-up ground, loamy sand, wet ballast and mottled clay.

The bulk of the new work is now completed and is to be thrown open to the public tomorrow, although already one of the escalators had been used for the extra rush of traffic due to the Cup Final last Saturday. The only section of the work remaining to be undertaken can now be put in hand, following the closing of the old lift shafts which up to the present have stood in the way of completing that part of the booking hall amenities under the old station building. This is one of the most intricate parts of the whole work, as eight existing stanchions on the old station frontage have to be supported on new steelwork a little below the street level, and the existing foundations beneath them removed, so that in future the area which now consists of cellars, foundations and lift shafts will be thrown open for the final section of the booking hall and its adjacent amenities.

One of the old lift shafts is being retained as an extracting ventilator. From the bottom of this shaft an air duct tunnel is being driven to connect it with the Hampstead and the Piccadilly tubes.

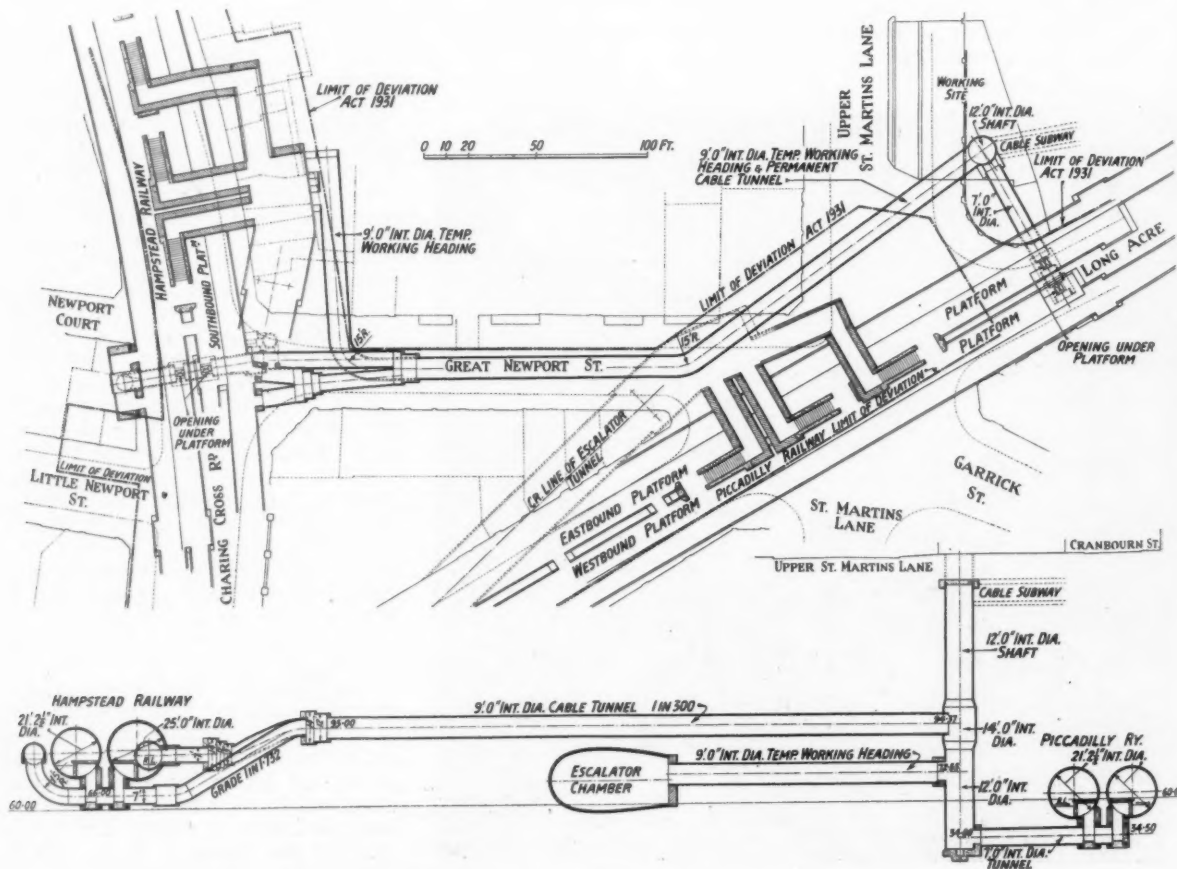
This is the ninth of the London Underground stations to have been constructed on the same principle of a large sub-roadway circulating area with multiple entrances from the adjacent streets giving access to the platforms by means of escalators. The first of this type was the Bank, and subsequently the stations of generally similar type at Trafalgar Square, Piccadilly Circus, Manor House, Chancery Lane, Green Park, Marble Arch, Knightsbridge, and

Hyde Park Corner were brought into use. With the completion of Leicester Square most of the main stations in the Central London area will now be thoroughly up-to-date.

The work at Leicester Square, however, being immediately beneath the junction of two very heavily trafficked streets and complicated by an extraordinary number of pipes, mains, and sewers, has involved more difficult work than that of any of the others, and consequently has taken longer time. Its completion with so little obstruction to the traffic in the streets is a tribute to the London Passenger Transport Board, its consulting engineers, architects, contractors, and its very able staff.

The main contractors for the construction work were John Mowlem & Co. Ltd. and John Cochrane & Sons. Ltd., with Waygood-Otis Limited for the escalators. The work has been carried out under the general supervision of Sir Harley H. Dalrymple-Hay, Consulting Engineer to the London Passenger Transport Board, to the requirements of the Board as specified by Mr. Arthur R. Cooper, Chief Engineer. The Resident Engineer was Mr. D. F. C. FitzGerald. The architectural work has been carried out to the designs of Adams, Holden & Pearson, acting in collaboration with the architectural staff of the London Passenger Transport Board.

The progressive increase in traffic at Leicester Square station, which has trebled the number of passengers in 25 years, is referred to in an editorial article on page 841.



Plan and section showing tunnels, shafts and working headings



The old L.C.C. pipe subway was useful in connection with the excavation of some of the foundations and the placing of the new steelwork



Connection between old L.C.C. pipe subway and inclined shaft to new deep level subway

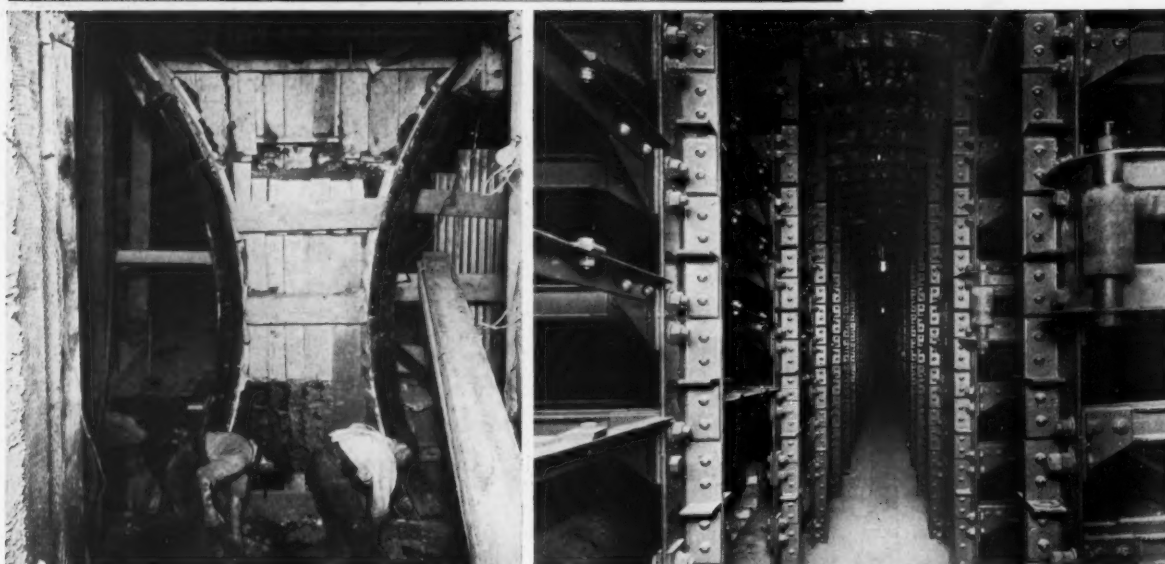
**The New
Leicester Square
Station, London
Passenger Transport
Board**

(See article on page 857)



Above : An exit from the subsurface circulating area leading to Charing Cross Road near St. Martin's Court

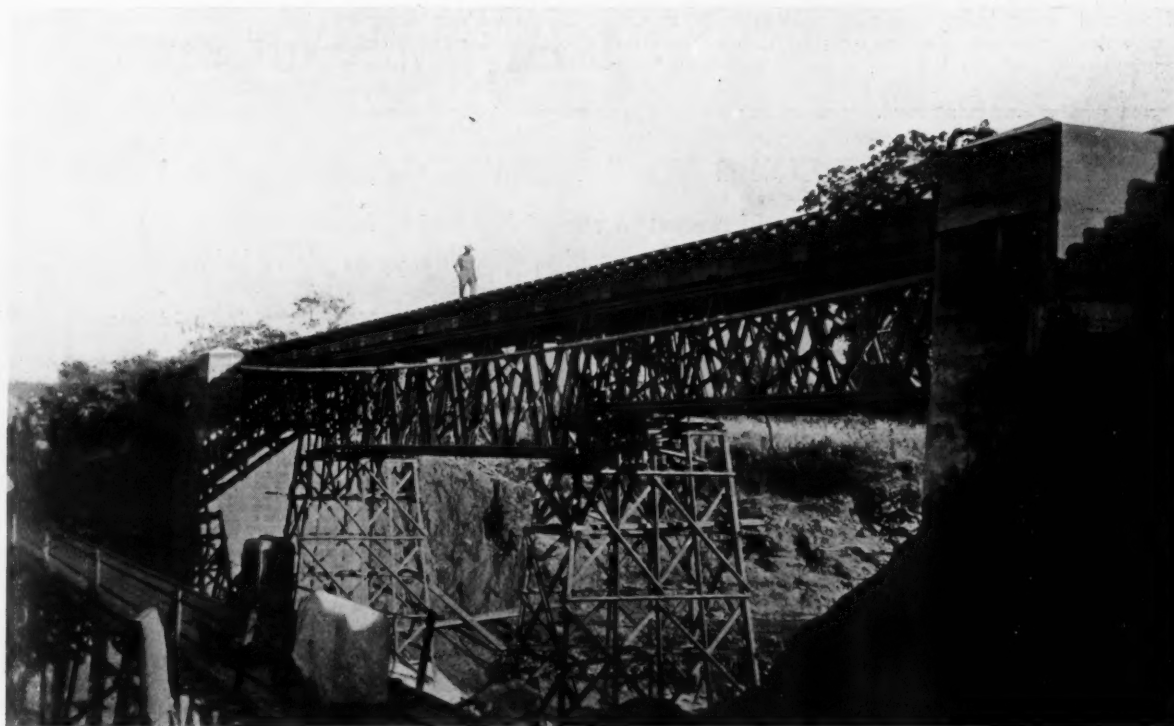
Left : Lower landing of the Hampstead Line escalators



Left : Station tunnel segments removed to make room for new stairways between platforms and escalators. Right : Interior of new L.C.C. pipe subway showing pipe and cable racks



Rio Ceniza Bridge on the Salvador Railway as rebuilt after the destructive hurricane last year. The remarkable manner in which it was locally fabricated from scrap material is described on page 864



Another view of the Rio Ceniza Bridge looking towards San Salvador and showing the up-stream side

NOTABLE BRIDGE REBUILDING, SALVADOR RAILWAY

(See article on page 864)

NEW SENTINEL RAILCAR IN FRANCE

A 300 h.p. Sentinel-Cammell type steam railcar has just been brought into service on the Northern Railway of France

FOR service on the secondary lines of the C. de f. du Nord a new steam railcar has recently been delivered by Les Ateliers de Construction du Nord de la France et des Mureaux, which firm has acquired the licence to build this type of vehicle in France.

The lines on which the railcar is designed to work are undulating, with gradients of 1 in 65 to 1 in 100, and have stations at an average distance apart of about 3 km. The booked speeds average 50 km. (31 m.) p.h. In view of the short runs the maximum speed of the railcar is limited to 85 km. (53 m.) p.h.

The accompanying drawings indicate the main dimensions and general layout of this railcar which is of all-welded steel construction, the body and underframe being in the form of a tubular girder. This type of welded girder construction reduces the weight to a minimum and provides great strength.

The boiler is of the Woolnough three barrel, water tube type working at a pressure of 23 hpz. (333 lb. per sq. in.). The heating surface of 28 sq. m. (301 sq. ft.) permits of the evaporation of 3,600 kg. (7,937 lb.) of water an hour, and the superheater gives a steam temperature of about 400° C. (752° F.). The firing, which is by heavy oil, is entirely automatic so that only one man is required for driving. A Wallsend type of burner vaporises the fuel by means of a steam jet, the quantities of oil and steam being regulated automatically in such a way that vaporisation exactly corresponds to the steam requirements, and the boiler pressure is maintained con-

stant. A photo-electric cell, actuated by relays, cuts off the oil feed in case the burner should for any reason go out. This avoids wastage of oil and eliminates any danger of unburnt oil flowing into the firebox.

A Weir type double acting feed pump, automatically controlled by a Robot float, regulates the feed according to the level of the water in the boiler. An emergency injector is also provided. Should the water level fall abnormally an automatic device comes into operation to stop the flow of oil to the burner. The feed water on its passage through the feed heater precipitates in the form of mud any salts which it may contain. The railcar can be driven from either end and the various indicators are provided in duplicate in both control cabins.

There are two 6-cylinder Sentinel engines suspended transversely beneath the frame, giving a total of 300 h.p. at 500 r.p.m. The cylinders are horizontal and the steam distribution is by means of poppet valves. Each engine is geared to the inner axle of its neighbouring bogie through the intermediary of an elastic coupling and a carden shaft.

In each driving compartment there is a control for the double-port regulator and the cut-off can be varied by a hand wheel device. Spencer Moulton shock absorbers are fitted on the bogies, the axles of which are mounted in Timken roller bearing boxes. Westinghouse automatic brakes, low pressure steam heating and electric lighting provided by a turbo generator complete the equipment.

SCRAP RAILS WELDED TO FABRICATE GIRDERS AND PIERS

A remarkable achievement accomplished with local labour in El Salvador in the renewal of a high level three-span girder bridge

IN June last the Republic of El Salvador was swept by a fierce hurricane, accompanied by a rainfall of over 20 inches within a period of 24 hours. The Salvador Railway was severely damaged and many of its steel bridges were destroyed. Some very unusual work was done in replacing these, and on page 863 we reproduce photographs of one of the rebuilt structures. In describing it, we cannot do better than quote the report of the General Manager, Mr. W. Noel Green, to the London office of the railway company, which runs as follows:—

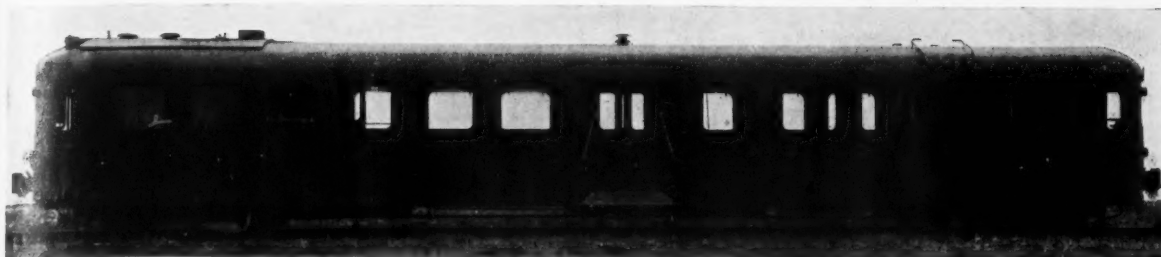
It consists of three spans of 42 ft., 56 ft. and 24 ft. respectively, supported on the masonry of an old bridge which was discovered after the wash-out last June, and two steel towers. The metal work is composed entirely of rails and electric welding metal (of which there are some 8,000 lb.), the only exception being the troughs which hold the timber rail-bearers in position, and which are made of ½-in. boiler plate welded to the tops of the spans. The calculated deflection for the main span with our heaviest engine and 50 per cent. impact was one-fifth of an inch. A test load of 100 tons caused a deflection of a little more than half of that—one-eighth of an inch.

We, here, feel a certain pardonable pride in this bridge, for we believe that it must be the only one of its kind in Central America, if not in the world. We have not yet got out the costs, but the rails are all scrap and the only real cost was welding metal and labour. It is capable of carrying loads much heavier than any we have at present, the maximum stress in

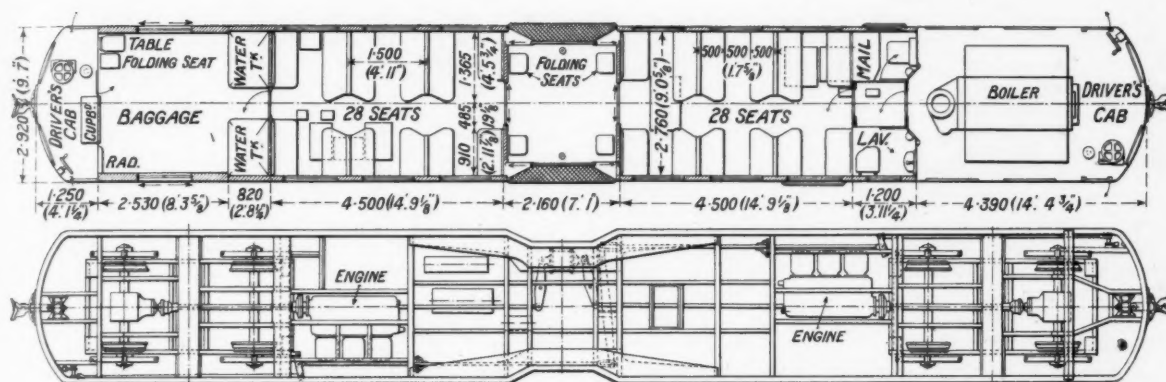
any member being 8,000 lb. p. sq. in., which occurs in the web members at the ends of the 56-ft. span.

The bridge was designed by Mr. Noel Green, and was fabricated entirely by local Salvadorean labour. Its completion is undoubtedly a remarkable achievement upon which Mr. Green and his staff are to be congratulated. We are indebted to Mr. F. C. Tillbrook, Managing Director and Secretary of the Salvador Railway Company, for kindly supplying and permitting us to publish the illustrations and information, some of which is part of the General Manager's official report to his Board of Directors.

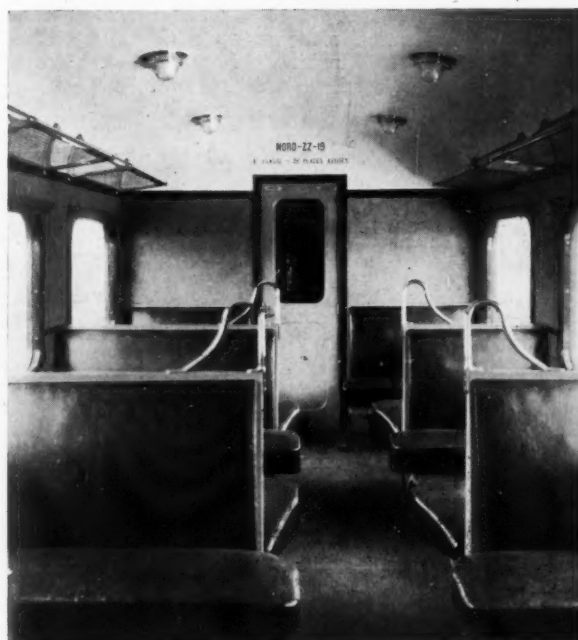
RAILWAY SAFETY IN U.S.A.—In 1932, although 478,800,122 passengers were carried, only a single one was killed in the United States in a train accident. On the New York Central Lines, for example, no passenger has been killed in a train accident since 1927. These records have been made despite a steady advance in passenger train speeds, until now speeds of seventy miles or more, with trains of a thousand tons or more, are daily accomplishments.—*Mr. Frederick E. Williamson, President of the New York Central Lines.*



The new Sentinel-Cammell steam railcar for the Northern Railway of France



Plans showing interior arrangements and line of transmission of the railcar



The passenger compartment (left) and view through car from the entrance (right) of the Sentinel-Cammell unit

NEW SENTINEL RAILCAR IN FRANCE

(See article opposite)

MECHANISED BOOKING OFFICE AT LIVERPOOL STREET

New automatic printers installed by the L.N.E.R. to expedite the issue of tickets and booking office routine

IN THE RAILWAY GAZETTE of June 5, 1931, we described the wholly mechanised booking office installed by the L.N.E.R. at the Central station, Newcastle-on-Tyne. This experiment in dealing with heavy suburban bookings has proved so satisfactory that the L.N.E.R. recently decided to apply it on a larger scale by total mechanisation of the east side booking office at Liverpool Street station. This mechanised system of ticket issue and accountancy was brought into use on May 1.

A new and commodious glass fronted office has been erected, the design having the dual object of giving a clear view to the staff in charge of the ticket printing machines of the flow of traffic, and enabling the travelling public to observe the process of obtaining their tickets.

In addition, the vision of the internal work of the office and the speed of the machines may be expected to produce quicker movement by the public from the booking windows, an advantage of importance at such a busy station. The interior of the new booking office is entirely devoid of the now familiar impedimenta, such as ticket stock, racks, and dating presses; in place thereof, seven electrically controlled ticket issuing machines, manufactured by the Westinghouse Ticket Machine Co. Ltd., have been installed, capable of printing and recording 3,040 series of printed and blank tickets. The machines comprise two rapid printers, each containing 20 units; four multi printers of 500 units each; one multi printer of 1,000 units.

The rapid printing machines, which are similar to those used on the Underground railways, each contain 20 printing units, standing side by side, in a locked cabinet, and are operated by a keyboard similar to that of a typewriter. The keys, upon which are indicated the series of tickets, operate the printing units, which are set in motion by a slight pressure of the appropriate key. The keys are interlocked in such a way that only one printing unit can be operated at the same time, but the number of tickets required can be gauged by a short pressure for one ticket, up to a maximum output of about 240 tickets a minute by keeping the key depressed. Each of the 20 printing units is a small printing machine in itself and consists of one pair of transport rollers, which include the dating device, and a second pair of rollers, contained in an exchangeable block, which hold the printing plates, numbering mechanism and visible check counter. The detachable unit allows for tickets of other denominations being substituted as required by traffic conditions. The printing unit is fed from its own roll of ticket card, which is stored below each unit. When the printing unit operates, the pair of transport rollers draws the card through the previously opened guillotine exactly to the length of one ticket. At the same time the printing plate or plates attached to the second pair of rollers imprints the letterpress and serially numbers the ticket. Each printing unit is provided with automatic cutouts so that no ticket can be printed if the card runs short or is not inserted.

The tickets in any one printing unit, after being printed and cut off, fall on an endless moving band which transports them to the ejecting hopper, and are from there automatically discharged on to the counter in front of the passenger. For accounting purposes, the number of tickets issued can be readily ascertained from the counters of each unit.

Of the five multi printer machines installed, three are automatically fed from rolls of blank card, and two hand-fed with pre-cut blank card of exact ticket size. The multi printer consists of three main parts: the main frame with the magazine containing the printing plates; the sliding frame to which an index polygon to the ticket plates is attached for direction of the booking clerk; and the printing carriage with control strip boxes, totaliser, automatic card feed device and electric motor. The printing plates, which cover the usual text shown on railway tickets, are disposed side by side vertically in rows in the magazine. The actual printing, however, is performed in the printing carriage, which can be moved to a position over any of the printing plates. These are locked in the machine and only those in the row over which the printing carriage stands can be removed. When the machine is operated the printing carriage draws up the appropriate printing plate, prints, numbers and dates the ticket, replaces the printing plate in its proper position in the magazine and ejects the printed ticket.

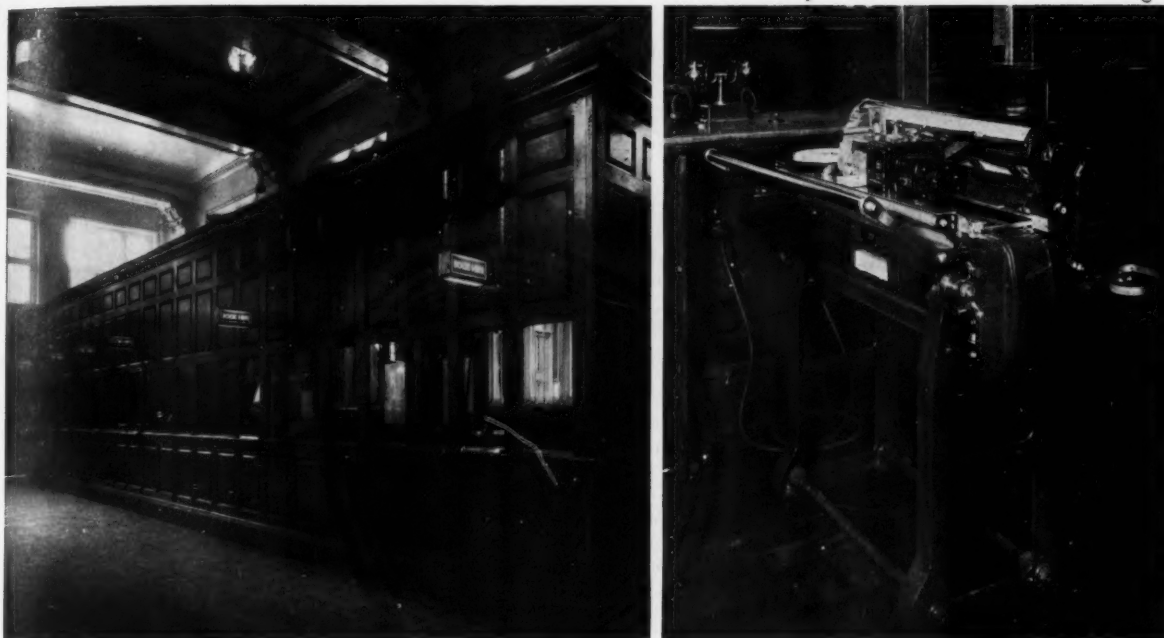
The multi printer, and in particular its printing carriage, is provided with various interlocks and safeguards so as to make it impossible to remove the printing plates from the machine or gain access to the control box containing the recording strip without the use of special keys. The printing, moreover, of progressive numbers on each series of tickets is essential, and the mechanism for ensuring this also automatically moves forward immediately a ticket is printed. The printing movement cannot be made unless a ticket is available in the machine, thus making it impossible for a number to be dropped, nor can a ticket be removed until printed.

For accountancy purposes the multi printer machines register the issue of all tickets at the appropriate fares on two control strips, one of which is used by the booking clerk. The other control strip is contained in a locked case and is for the use of the agent or auditor. For statistical purposes and in order that the number of tickets to any particular station may be ascertained, the printing of a ticket is also automatically recorded on a dissector, the reading of which can be taken from time to time.

The use of machinery in substitution for pre-printed tickets has necessitated several important changes in the style and colour of tickets being made. These are as follow:—

- (i) One standard colour of card, namely, light mauve, will be used for all descriptions of tickets, whether single or return, or first, second, or third class;
- (ii) The class will be indicated on the tickets by large numerals, namely, 1, 2 or 3, as the case may be;
- (iii) Tickets will be printed on one side only, the reverse side being left blank;
- (iv) The return half of return tickets will be represented by the larger portion, and includes the conditions of issue.

The experiment is important inasmuch as the use of machinery in the booking office of the main line companies is very limited, although mechanised methods are already well established in the counting houses of British railways. The advantages to be derived from a system which provides for tickets being printed and issued in the booking office as required by traffic circumstances are obvious, both in respect of administration and from the point of view of the detail of booking office work.



Left : Exterior of mechanised booking office. Right : Electrically-controlled ticket issuing machine



Battery of electrically-controlled ticket issuing machines in the mechanised booking office at Liverpool Street station, L.N.E.R.

REORGANISED CHAIR FOUNDRY AT SWINDON, G.W.R.

*Approximately 200 tons of iron castings
are produced weekly at this plant*

THE chair foundry at the Swindon works of the Great Western Railway has recently been reorganised and the two cupolas, manufactured by the Horsehay Co. Ltd., employed for melting iron for use therein have been converted to the balanced blast system developed by Mr. J. E. Fletcher for the British Cast Iron Research Association. The lower portion of one cupola is shown in the second of the accompanying illustrations. The object of the system is to improve the quality of the iron, reduce bridging troubles at the tuyeres, and to reduce the coke to iron ratio. The alterations involved the provision of a new wind belt incorporating eight-valved tuyeres at the lowest portion with three further rows of tuyeres above. These also can be seen in the illustration. A higher primary blast pressure was required, and the steam driven blower which had been in service for many years was superseded by a No. 6 Keith & Blackman blowing fan capable of delivering 6,500 cu. ft. of air a minute at 26 in. water gauge, driven by a 65 h.p. electric motor. The reduced admission of air through the lower tuyeres diminishes the amount of free oxygen in the outer annulus of the cupola section but increases the carbon monoxide content in the lower portion of the coke bed. The gradual addition of further air through the upper tuyeres progressively increases the carbon dioxide content and also the temperature as the top of the coke bed is approached.

The Swindon chair foundry produces about 200 tons of chairs and brake blocks weekly; the chairs being mainly of the 95-lb. British Standard type, but there is also a considerable quantity of switch and crossing chairs of many designs cast to meet the requirements of the points and crossings shop in the manufacture of permanent way fittings. It has been in operation for about 50 years and last year it had reached a stage when the roofing required almost complete renewal. The opportunity, therefore, was taken of straightening its outline and incorporating into one building a number of out-buildings



Balanced blast chair foundry cupola

housing subsidiary plant, sand mills, fettling benches and similar equipment. It now forms in plan an L shape, covering a floor area of 19,600 sq. ft. The lantern roof and louvres provide amply for light and ventilation. The flooring is of plate to allow free movement for the ladle trolleys and also for the Swindon type of pattern-drawing, hand-ramming moulding machines along the rows of casting positions.

We are indebted for the above information to Mr. C. B. Collett, O.B.E., Chief Mechanical Engineer, G.W.R., and also for facilities for taking the photographs from which the illustrations have been prepared.



*Left: General view of
chair foundry at the
G.W.R. locomotive works,
Swindon*

RAILWAY NEWS SECTION

PERSONAL

Mr. M. N. Varvill, M.C., M.Inst.C.E., whose retirement from the position of Chief Engineer, Rhodesia Railways, was foreshadowed in THE RAILWAY GAZETTE of April 12, is now on preparatory leave in this country. He gained valuable experience in India prior to the war, especially in survey and construction work, and was one



Mr. M. N. Varvill, M.C.,

Retiring Chief Engineer, Rhodesia, Beira, and Mashonaland Railways

of the Indian railway officers who volunteered for service and accompanied the original East African Expeditionary Force. He served with distinction as a Royal Engineer officer upon military railways in East Africa, was mentioned in despatches and was awarded the M.C. During his tenure of office as Chief Engineer on the Rhodesia, the Mashonaland, and the Beira Railways, Mr. Varvill was responsible for important reconditioning works which included a large mileage of relaying and re-sleepering, in addition to the construction works previously mentioned. He was elected an Associate Member of the Institution of Civil Engineers in 1908 and was transferred as a full Member in 1924.

Brigadier-General Sir Harold Hartley, C.B.E., F.R.S., Vice-President of the Executive Committee, London Midland & Scottish Railway, has been appointed by the Board of Trade to be a member of the committee to report upon measures to be taken in connection with the expiry next year of the Safeguarding of Indus-

tries Act, 1921, as amended by the Finance Act, 1926.

The King has been pleased to approve the appointment of Mr. A. U. M. Hudson, M.P., as Parliamentary Secretary to the Ministry of Transport.

Mr. P. Faulkner has been appointed Private Secretary to the Permanent Secretary to the Ministry of Transport in succession to Mr. S. S. Wilson, promoted.

Captain Austin Hudson, M.P., Parliamentary Secretary to the Ministry of Transport, has appointed Mr. A. C. Crossley, M.P., as his Parliamentary Private Secretary and Mr. A. M. Rake to be his Private Secretary.

The Secretary to the Ministry of Transport announces that Mr. T. P. Wilmsburst, M.B.E., M.Inst.C.E., M.I.E.E., will complete his term of office as an Electricity Commissioner in July next, and the Minister of Transport has with the concurrence of the Board of Trade appointed Mr. C. G. Morley New, M.I.E.E., to fill the vacancy.

Mr. L. A. Woodbridge, M.Inst.C.E., Chief Engineer, Central Argentine Railway, returned to Buenos Aires from leave in Europe on March 17.

We regret to record the death, on April 28, of Mr. Leonard Archbutt, who prior to the grouping held an important post as a chemist on the former Midland Railway at Derby.

We regret to learn of an accident sustained—in the course of an international polo match at Monte Video—by Mr. H. H. Grindley, General Manager of the Central Uruguay Railway.

The Crown Agents for the Colonies have recently made the following appointments:—

Mr. L. T. Stott, to be Chief Accountant, Railway Department, Ceylon.

Mr. C. B. Watson, to be Assistant Engineer, Railway Department Nigeria.

Mr. H. Wood Robinson, B.A. (Oxon), A.M.Inst.C.E., has been appointed to succeed Mr. W. T. Everall, O.B.E.—whose portrait and biography we published in our issue of March 29—as Deputy Chief Engineer, Bridges, North Western Railway, India.

Mr. Wood Robinson was educated at Portsmouth Grammar School and Llandovery College. He went up to Balliol College, Oxford, in 1913 and took first

class honours in Mathematical Mods. a year later. He joined the Army in 1915, and subsequently served with the Royal Garrison Artillery, both at home and in Mesopotamia. After the war he returned to Oxford, passing out in 1921 with first class honours in Engineering Finals. Mr. Wood Robinson was appointed in 1923 as an Assistant Bridge Engineer on the North Western Railway and in 1928 was transferred



Mr. H. Wood Robinson, B.A.,

Appointed Deputy Chief Engineer, Bridges, North Western Railway, India

to the Madras & Southern Mahratta Railway as Bridge Engineer, a post he held until a few months ago, when he returned to the North Western Railway with a view to taking charge of the Bridge Department when Mr. Everall proceeded on leave preparatory to retirement.

Mr. I. Tanaka, the Resident Representative of the Japanese Government Railways in this country, has returned to Japan, and has been succeeded by Mr. Goro Okada.

Mr. J. H. Condry, M.Sc., M.Inst.C.E., A.M.I.Mech.E., has been appointed an officer of the London Passenger Transport Board with the title of Assistant Engineer (Permanent Way), the appointment having effect from January 1, 1935.

Mr. Clarence I. A. Dubs has joined the board of the North British Locomotive Co. Ltd. Mr. Dubs is a son of the late Mr. Charles Ralph Dubs, one of the original directors of the company, and a grandson of the late Mr. Henry Dubs, founder of one of the

constituent firms, Dubs & Co., of Polmadie.

Sir Josiah and Lady Stamp sailed from Liverpool on April 25 for Canada. They expect to be away for about two months.

Sir Francis L'Estrange Joseph, C.B.E., D.L., a Director of the London Midland & Scottish Railway, has been elected a member of the board of the Birmingham Railway Carriage & Wagon Co. Ltd.

Mr. Cumberland Lowndes, sometime Chief Outdoor Goods Manager of the old London & North Western Railway, whose death we announced in our issue of January 25, left estate valued at £19,664 (£19,629 net).

Mr. H. C. Allen, sometime Chairman of the Buenos Ayres Great Southern and at the time of his death—which we announced in our issue of March 15 last—Director of this and of other British-owned South American railways, left estate valued at £37,360 (£23,081 net).

The following have been elected as officers of the Railway Students' Association for the year 1935-36:—

Lt.-Col. Gilbert S. Szlumper, C.B.E. (Assistant General Manager, Southern Railway) as President.

Mr. A. H. Lingard (Commercial Assistant, Southern Railway), as Vice-President.

Mr. A. F. Wallis, as Honorary Secretary, and

Mr. R. J. Eaton, as Honorary Assistant Secretary, the two latter being re-elections.

Mr. J. A. Meelboom, whose recent retirement from the position of Assistant to the General Manager of the Central Argentine Railway was recorded in THE RAILWAY GAZETTE of March 29, was entertained by the Local Directors, Chief Officers and Lawyers at a farewell luncheon given at the Jockey Club, Buenos Aires, on March 27. He was presented with a silver cigar box, bearing a suitable inscription and the autographs of his late railway colleagues. Tributes to Mr. Meelboom's personal worth and long years of devotion to duty were paid by the Chairman of the Local Board (Engineer Atanasio Iturbe) and the General Manager (Mr. Ronald Leslie). Mr. Meelboom suitably responded.

INDIAN RAILWAY STAFF CHANGES

Sir James Williamson, Kt., Agent of the Bengal & North Western and Rohilkund & Kumaon Railways, has proceeded to England on 7 months' leave and Mr. J. D. Westwood, Traffic Manager, has been appointed to act as Agent of these railways during his absence. Mr. R. Hannay, Assistant to Traffic Manager, has been appointed to officiate as Traffic Manager.

Mr. W. E. G. Bender, Chief Engineer has also proceeded on leave and has been succeeded by Mr. J. C. Barrack, Resident Engineer, Rohilkund & Kumaon Railway.

Messrs. E. M. Slane, Chief Auditor of these Railways; D. A. Fettes, Deputy Agent, Rohilkund & Kumaon Railway; J. A. Smith, Locomotive and Carriage Superintendent, Bengal & North Western and Rohilkund & Kumaon Railways, and Mr. G. M. Smith, Controller of Stores, Bengal & North Western Railway, Samastipur, are shortly proceeding on leave and will be relieved respectively by Messrs. G. D. Laurie, W. Paton, W. T. S. Cairns and J. B. Haskins. Messrs. E. M. Slane and D. A. Fettes are proceeding on leave preparatory to retirement.

Mr. T. Petersen, Assistant Managing Director of Callender's Cable & Construction Co. Ltd., whose death we announced in our issue of November 9, left estate valued at £9,039 (£811 net).

FUNERAL SERVICE OF MR. P. H. PRICE, LATE SECRETARY, RAILWAY CLEARING HOUSE

The funeral of Mr. P. H. Price, late Secretary, Railway Clearing House, whose death was recorded in last week's issue, took place on Wednesday. The service was held at the New Barnet Methodist Church and the interment followed at Totteridge. Dr. Gregory conducted the service and in the course of an address ably reviewed Mr. Price's career and his admirable personal characteristics and business ability. At the conclusion of the service the *Nunc Dimittis* was sung by the Railway Clearing House Male Voice Choir.

In addition to family mourners (namely, Mr. P. Gordon Price, son; Rev. P. J. Boyling, son-in-law; Miss E. Price, niece; Mr. Kenneth Price, nephew; Dr. J. N. Langdon, nephew; Mr. F. R. Langdon, nephew; Mr. Gwynne Paterson, nephew; Rev. R. A. Michelson Brown; Mr. W. Horton; and Mr. J. D. Maynard); there were among the very large congregation at the service:—

Sir Ralph L. Wedgwood (Chief General Manager, L.N.E.R., and Chairman, General Managers' Conference); Messrs. W. V. Wood (Vice-President, L.M.S.R.); G. H. Barfoot (representing Sir Herbert Walker, General Manager, Southern Railway); H. E. Hedges (representing Sir James Milne, General Manager, G.W.R.); G. Royde Smith (representing Sir Josiah Stamp, Chairman and President of the Executive, L.M.S.R.); E. E. Painter (representing Sir Francis H. Dent, Chairman, Railway Clearing House); Hon. E. G. Eliot (Solicitor to the Railway Clearing House); A. E. Kirkus (Ministry of Transport); G. Cole Deacon (Secretary, Railway Companies' Association—also representing Mr. H. L. Thornhill, Chief Legal Adviser, L.M.S.R.); G. Ridley (representing Railway Clerks' Association); J. S. Anderson (Secretary, London Passenger Transport Board); T. E. Argile (Assistant Chief Commercial Manager, L.M.S.R., also representing Mr. Ashton Davies, Chief Commercial Manager); W. M. Barrington-Ward (Superintendent, Southern Area (Western Section), L.N.E.R.); R. Brown (Assistant to Chief Accountant, L.N.E.R.); O. Bulleid (Assistant to Chief Mechanical Engineer, also representing Mr. H. N. Gresley, Chief Mechanical Engineer, L.N.E.R.); F. Bushrod (Superintendent of Operation, Southern Railway, and Chairman of Superintendents' (Operating) Conference and Railway Research Service); C. R. Byrom (Chief Operating Manager, L.M.S.R.); A. L. Castleman (London District Goods Manager, L.M.S.R.); H. S. Chapman (Assistant Secretary, London Passenger Transport Board); J. Clayton (representing Mr. R. E. L. Maunsell, Chief Mechanical Engineer, Southern Railway); J. Cliff (London Passenger Transport Board); R. Cope (Chief Accountant, G.W.R.); E. C. Cox (Traffic Manager, Southern Railway, and Chairman, Superintendents' (Coaching Traffic) Conference); P. J. Dowsett (Assistant Secretary, L.N.E.R.); W. F. N. Edwards (London Passenger Transport Board); J. F. Gee (late Chief Accountant, L.M.S.R.); K. W. C. Grand (General Assistant to Superintendent of the Line, G.W.R.); W. H. Hanscombe (Assistant Solicitor, L.N.E.R., also representing Mr. I. Buchanan Pritchard, Chief Legal Adviser); R. H. Harvie (representing Mr. W. Yeaman, Commercial Manager, Scotland, L.M.S.R.); E. S. Hawkins (late General Manager, Colne Valley & Halstead Railway); A. G. Hubbard (Solicitor, G.W.R.); W. H. Hyde (late General Manager, G.E.R., and Acting Chairman, Railway Benevolent Institution); A. Ingram (representing Mr. J. G. Singer, Traffic Superintendent, Northern Scottish Area, L.N.E.R.); H. Marriott (late Goods Manager, L. & N.W.R.); E. F. Marsh (representing Joint Accountants, Southern Railway); G. Marshall (Goods Manager, Southern Area, L.N.E.R., and Chairman, Goods Managers' Conference); A. Maynard (Chief Goods Manager, G.W.R.); J. C. Mitchell (late Secretary, London "Underground" Railways); R. J. Moorcock (representing Mr. S. T. Burgoyne, Passenger Manager, North Eastern Area, L.N.E.R.); A. E. Moore (Audit Accountant, Southern Railway); G. Morton (Assistant Accountant, L.M.S.R.); C. H. Newton (Chief Accountant, L.N.E.R.); R. H. Nicholls (late Superintendent of the Line, G.W.R.); A. G. Pollard (Assistant to Accountant, G.W.R., and Railway Accountants' Committee); F. R. Potter (Principal Assistant to Superintendent of the Line, G.W.R., also representing Mr. H. L. Wilkinson, Superintendent of the Line); J. Purves (Assistant to Chief Mechanical Engineer, L.M.S.R., also representing Mr. W. A. Stanier, Chief Mechanical Engineer); C. J. Selway (Passenger Manager, Southern Area, L.N.E.R., also representing T. Hornsby and G. F. Thurston, Divisional General Managers); E. Taylor (Chief Accountant, L.M.S.R.); H. N. Trye (Traffic Auditor, London Passenger Transport Board); J. Walker (representing Mr. A. E. Sewell, Goods Manager, Southern Scottish Area, L.N.E.R.); R. B. Walker (Traffic Manager, M. & G.N. Jt. Com.); W. K. Wallace (Chief Engineer, L.M.S.R.); H. C. Walton (Secretary, Railway Benevolent Institution); J. S. Wilson (Assistant Audit Accountant, Southern Railway); W. Wood (Assistant Signal and Telegraph Engineer, L.M.S.R., also representing Mr. A. F. Bound, Signal and Telegraph Engineer, and Mr. S. J. Symes, Chief Stores Superintendent); J. E. Sharpe (representing Col. H. H. Mauldin, Superintendent Eastern Section, Southern Area, L.N.E.R.); T. C. Bird, J. C. Bowyer, E. J. Cook, J. Drinkwater, A. E. Hammett, F. C. Howard, H. E. Machin, H. E. Pedley, J. E. Randall, J. E. T. Stanbra, and H. B. Webster. Also a large representation from past and present Officers and Staff of the Railway Clearing House.

Sir George Truscott; Sir Harold Bellman, and Messrs. M. F. Barnard (representing British Iron and Steel Federation); T. S. Blenkinsop (Mitchell Conveyor & Transport Co. Ltd.); F. W. Buckman (representing Sir Alfred Read); W. J. Clench (representing Traders' Co-ordinating Committee, and Messrs. Evan Williams and W. A. Lee, Mining Association of Great Britain); W. J. Elliott (General Manager, Pickfords Limited); W. H. Gaunt (President, Mansion House Association on Transport); A. Winter Gray (Secretary, Institute of Transport); H. Griffiths and L. Beckett (J. Lyons & Co.); E. Huskisson (Thos. Cook & Son); T. W. Jacobs (Thames Steam Tug & Lighterage Co.); Leslie Jones (Secretary, Carter Paterson & Co.); J. A. Kay (Editor, THE RAILWAY GAZETTE); D. R. Lamb (Editor, Modern Transport); M. Salt (representing shipping companies); G. Stubbs (late Deputy Government Chemist); W. S. Tredgold and Dennis Truscott (Directors, J. Truscott & Son); and P. Wharton (representing Coast Lines Limited).

New Games Wing at Bridge House, Dawlish

On Saturday, April 27, Sir Robert Horne, Chairman, G.W.R., opened a new games wing at the Railway Convalescent Home, Bridge House, Dawlish, Devon. The architect, Mr. J. Archibald Lucas, F.S.I., F.R.I.B.A., presented Sir Robert with a golden key wherewith to perform the opening ceremony, after which Sir Robert unveiled

throughout. Work on the new wing was begun in June, 1934, and was carried out by E. C. Lea & Co. Ltd., of Exeter, under the direction of the architect.

In an address to the guests, patients and staff after the opening, Sir Robert Horne said there must be thousands of men and women in this country

As a Scot, Sir Robert said he could not admit that Dawlish was better than Ascog on the Isle of Bute, although he was bound to recognise the force of figures when he was told that 1,600 patients were accommodated at Bridge House every year. The home was opened in 1918 and enlarged in 1929, but even then it was impossible to provide a proper billiard room and rooms for other recreations. Last year, Mr. Randall, the Visiting Trustee to Bridge House, had conceived a scheme for providing a games wing. Mr. Lucas, on being approached, had given the scheme practical shape and the Trustees, in due course, passed the plans.

The Chairman of the Board of Trustees (Mr. F. W. Wheddon) proposing a vote of thanks to Sir Robert Horne, said the Trustees had given much thought to ways of raising the standard of comfort at the homes and this new wing was but one outcome of their deliberations. Mr. Randall seconded the motion. Sir Robert then made a tour of inspection of the home and the grounds.

Among the guests were:—

Messrs. R. W. Higgins, Divisional Traffic Superintendent, Exeter; R. W. Thurtle, G.W.R. Magazine; F. W. Wheddon, Chairman of the Board of Trustees; W. F. Smith, Vice-Chairman, R. W. J. Canham, R. O. Griffiths, F. C. Holder, R. E. Lyon, Percy Randall, F. T. Roach, G. H. Taylor, W. Tyrrell, J. Whyte, E. F. Wilkinson (Trustees); H. Haigh, Secretary Railway Convalescent Homes; J. Archibald Lucas, F.S.I., F.R.I.B.A., architect; Dr. Alec. A. Lees, Dr. Wood, Medical Officers, Bridge House; Mrs. Pearce, Matron; and Miss Campbell, Assistant Matron.

NEW ZEALAND RAILWAYS IN 1934-35.

—Messages from Wellington indicate that during the year ended March 31 last, the New Zealand Government Railways revenue increased by £295,162, while expenditure increased by £293,452 only, in spite of the fact that this figure included £150,000 representing the restoration of salary and wage cuts. Revenue exceeded estimates by £270,903.



Bridge House, Dawlish, showing the new games wing in the foreground. The connecting corridor can also be seen

a bronze plaque in the billiard room commemorating the event.

This new wing, which is of sound and weatherproof construction, has been designed to harmonise with the old buildings, and consists of a billiard room, 44 ft. by 31 ft., with two full sized billiard tables, and a general games room, 44 ft. by 25 ft., containing two full sized bagatelle tables and laid out for numerous other games. Both rooms are panelled in oak, and all the floors are of oak wood blocks. The new wing is joined to the old by a lofty glazed corridor. Electric light and central heating have been installed

who blessed the name of Passmore Edwards, the donor of the land for the first Railway Convalescent Home. One of the happiest periods in a man's life, he thought, was when he felt that health and strength were returning after illness. Behind the word "home" there was a wealth of meaning; it was a word which appealed to their hearts as the words "hotel" and "hydro" never could. The patients had good cause for gratitude to the Matron, Mrs. Pearce, for looking after them so efficiently at this, the busiest, although not the largest, home of the whole family.



Sir Robert Horne and group at the opening ceremony of the new wing at Bridge House Railway Convalescent Home, Dawlish

Jubilee Exhibition of L.M.S.R. Locomotives and Rolling Stock at Euston

Yesterday and today the L.M.S.R. staged a Jubilee exhibition of locomotives and rolling stock at Euston station which presented a cavalcade of railway progress during the 25 years of the King's reign. The central feature is the new 5 X P class 4-6-0 express passenger engine No. 5552, *Silver Jubilee*, which is exhibited with a train composed of the most modern types of passenger rolling stock. For purposes of

The 1910 train is composed as follows: corridor third brake; corridor third coach; composite dining car with kitchen; corridor first class coach; corridor composite car; corridor composite brake. The 1935 train consists of third corridor brake; first luxury corridor car; composite vestibule car; first dining car with kitchen; vestibule first car; vestibule third brake.

A special view of the exhibition was

quency of their trains. He had been asking Mr. Lemon some questions about the L.M.S. and he had been told it was the largest organisation in the British Empire. Other astounding figures which he had learned from Mr. Lemon were that on the occasion of a recent test, 99 per cent. of the trains ran to time throughout the whole system, and that 72 per cent. of freight was delivered within 24 hours of despatch.

Inspecting the 1935 train, he was amazed to find some of the compartments more like the rooms in an hotel.



The "Coronation" of 1911 and the new "Silver Jubilee" locomotives heading trains of representative rolling stock on exhibition at Euston station, L.M.S.R., yesterday

comparison there is also on view the ex-L.N.W.R. 4-4-0 "King George V" class locomotive *Coronation*, which was built at Crewe works in 1911, the year of Their Majesties' accession to the throne, and a series of coaches representing the 1910 period. *Coronation* was the 5,000th engine to be built at Crewe. *Silver Jubilee*, also built at Crewe, appears in a black and silver finish which has involved the use of a special chromium plating process.

given at midday yesterday, when Mr. Hore-Belisha, the Minister of Transport, was the principal guest. At the subsequent luncheon, presided over by Mr. E. B. Fielden, Mr. Hore-Belisha said that the demonstration would help to illustrate to the public the efforts the railway companies were making on their behalf. Not only were services being accelerated but, more important still, the railways had made great advances in the regularity and fre-

He had never been in a railway train that offered greater attractions. Whereas he had felt he might spend his summer holidays in going for a sea voyage, he now thought he would go for a railway cruise instead.

Among those present at the luncheon were:—

Messrs. C. R. Byrom, Ashton Davies, S. H. Firber, Sir Harold Hartley; Messrs. E. J. H. Lemon, Loftus Allen, H. V. Mosley, Col. A. H. L. Mount; Messrs. J. Purves, R. A. Riddles, O. Glynne Roberts, D. C. Urie, W. V. Wood.

LOCOMOTIVE ENGINEERS' GOLFING SOCIETY.—A spring meeting of the Locomotive Engineers' Golfing Society is to be held at Effingham Manor Golf Club on Friday, May 17, and the whole competition is open to all members of the Institution of Locomotive Engineers,

whether members of the Golfing Society or not. There will be an 18-hole medal round, on handicap, in the morning, for a challenge cup kindly presented by Mr. H. N. Gresley, President of the Institution, and a prize will also be given for the runner-up. In the after-

noon an 18-hole four-ball competition against bogey, on handicap, will be held for two silver tankards presented by Mr. Keith F. Pearson. Entries should be sent to the offices of the Institution of Locomotive Engineers, 28, Victoria Street, Westminster, S.W.1, by May 13.

Railway and other Reports

Barsi Light Railway.—The directors have declared a dividend of 2 per cent. (against 2½ per cent. a year ago) in respect of the half-year ended September 30, 1934, on the ordinary stock, payable on May 9.

Nitrate Railways.—The operations of the company during the past year resulted in a net profit of £58,240, but owing to losses on exchange, and the uncertainty of the position in view of the concession Iquique to La Noria terminating in July, 1936, the directors have decided not to recommend the payment of any dividend in respect of the year ended December 31, 1934.

Stewarts and Lloyds Limited.—The accounts for 1934 show that trading profits and dividends from subsidiary and allied undertakings aggregated £1,087,700, as compared with £630,258 for the previous year. The directors have provided for depreciation £300,000, compared with £186,000 and have written off out of profits £82,125 for debenture issue expenses. The sum of £140,000, against £65,000, is allocated to income-tax reserve and £175,000 to special reserve for contingencies. The dividend on the £4,626,740 of deferred capital and on 625 liaison deferred shares is 5 per cent., less tax, compared with 2½ per cent., less tax. A liaison share ranks as 1,000 deferred shares. The amount carried forward is £159,402, against £158,126 brought in.

Thames Valley Traction Co. Ltd.

—This company is jointly controlled by Tilling & British Automobile Traction Limited, and the Great Western and the Southern Railway Companies. The report for the year 1934 shows that after placing £10,000 to general reserve, and writing off the goodwill, there remains a balance of £11,514, which, added to £6,298 brought in, makes a balance available for distribution of £17,813. The directors recommend a dividend of 7½ per cent. (against 5 per cent. for 1933) on the share capital, absorbing £11,250, leaving £6,563 to be carried forward. Net traffic and other receipts, after providing for depreciation, amounted to £22,864. Investments include the company's holding in London Coastal Coaches Limited, which has been increased during the year by 1,000 shares.

Sharpness New Docks & Gloucester and Birmingham Navigation Company.—Tonnage passing in both directions showed an improvement during 1934, imports increasing by 89,214 tons to 675,968 tons, and exports by 10,419 tons to 32,843 tons. Receipts amounted to £110,620, or £13,242 more than in 1933, and expenditure was £55,726. The balance of £23,051 for disposal compared with £20,123 in the preceding year. The directors recommend payment of one year's dividend on the 5 per cent. "A" cumulative preference stock to December, 1934;

5½ per cent. on the "B" preference stock; 5 per cent. on the "C" preference stock; and 2 per cent. on the ordinary consolidated stock, all less income tax.

Albion Motors Limited.—A dividend of 5 per cent. less tax has been announced on the ordinary capital. The last ordinary dividend, in 1930, was 7½ per cent. less tax.

International Railways of Central America.—Gross income amounted to \$1,655,409 in 1934, as compared with \$1,585,135 in 1933, and the company covered its fixed charges 1.07 times. Net income, after depreciation and amortisation of discount on funded debt, but before sinking fund appropriations, was \$103,335 in 1934, as compared with \$14,225 in the previous year. During the 12 months under review the company had to face not only the continued business depression, but also an abnormal expenditure and loss of revenue resulting from the second major flood in two consecutive years. In spite of abnormal charges to operating expenses of \$216,800, net earnings available for fixed charges increased by about \$95,000. Total railway operating revenues were \$4,076,901, an increase of \$162,149 or 4.14 per cent. This is the first increase over the preceding year since 1929. Railway operating expenses amounted to \$2,902,679, an advance of \$110,281 or 3.94 per cent., and the operating ratio was 71.20 per cent. as compared with 71.33 per cent. in 1933. The average miles of main line operated were 795, and the total train miles were 1,591,965, a decrease of 491.

Associated Manufacturers of Electric Traction Equipments Limited

On inquiry we learn that certain manufacturers have decided in agreed cases to pool information and technical designs to assist in the standardisation of the electrical equipment for rolling stock in this country without, however, interfering with the manufacture of this class of apparatus in the works of the various firms interested. For that purpose a company has been registered called Associated Manufacturers of Electric Traction Equipments Limited, in which the following companies are jointly interested:—British Thomson-Houston Co. Ltd.; Crompton Parkinson/Allen West & Co. Ltd.; English Electric Co. Ltd.; General Electric Co. Ltd.; and Metropolitan-Vickers Electrical Co. Ltd. The operations of the Associated Manufacturers of Electric Traction Equipments Limited will be limited to dealing with the electrical equipment for rolling stock and does not apply to any other class of apparatus. The negotiations leading up to the formation of this company have probably given rise to the various statements that have appeared in the daily press.

Questions in Parliament

No Increased Tax on Railway Diesel Oil

Mr. D. G. Somerville, on May 1, asked the Chancellor of the Exchequer if he could state with regard to the new tax on diesel oil whether it was intended that railway diesel engines should be permitted to use untaxed fuel or not.

Mr. Duff Cooper (Financial Secretary to the Treasury) replied.—The proposed duty of 8d. a gallon will apply solely to oil used in road vehicles. Railway diesel engines will be entitled to run on oil which has paid only the existing duty of 1d.

Forthcoming Meetings

May 7 (Tues.)—Compagnie Internationale des Wagons-Lits et des Grands Express Européens [International Sleeping Car Company] (Annual General), 53, Boulevard Clovis, Brussels, at 2 p.m.

May 7 (Tues.)—San Paulo (Brazilian) Railway Co. Ltd. (Ordinary General), Southern House, Cannon Street, E.C., at 12.30 p.m.

Forthcoming Events

May 3 (Fri.)—L.M.S.R. (London) Orchestral Society, in Shareholders' Meeting Room, Euston Station, N.1, 7.30 p.m. Concert. Institution of Mechanical Engineers, Storey's Gate, London, S.W.1, 6 p.m. "Progress in Design and Application of the Lysolm-Smith Torque Converter, with Special Reference to the Development in England," by Messrs. H. F. Haworth and A. Lysolm; "Voith Turbo Transmissions," by Dr.-Ing. W. Hahn.

Railway Club, at Royal Scottish Corporation Hall, Fetter Lane, London, E.C.4, 7.30 p.m. "Railways in the Air," by Mr. J. W. C. Logan.

May 3-4.—Industrial Transport Association. Annual Examination.

May 4 (Sat.)—L.N.E.R. (Great Central) Lecture and Debating Society, at University College, Shakespeare Street, Nottingham, 4.30 p.m. Annual General Meeting.

May 6 (Mon.)—Industrial Transport Association, at British Iron and Steel Federation, Caxton House (East), Tothill Street, London, S.W.1, 6.30 p.m. "London's Traffic Problems," by Major H. A. Crawford, A.F.C.

May 7 (Tues.)—Institution of Civil Engineers, Great George Street, London, S.W.1, 6 p.m. James Forrest Lecture.

Institute of Transport (Metropolitan Graduate), at Inst. of Electrical Engineers, Savoy Place, W.C.2, 6 p.m. Annual General Meeting.

Hull Traffic Association, at Chamber of Commerce. Annual General Meeting.

May 8 (Wed.)—Institute of Metals, at Inst. of Mechanical Engineers, Storey's Gate, London, S.W.1, 8 p.m. Annual May Lecture, by Prof. W. L. Bragg.

Institution of Railway Signal Engineers, at Inst. of Electrical Engineers, Savoy Place, London, W.C.2, 6 p.m. "Traffic Actuated Road Signals," by Mr. F. Edwards.

May 8-11.—Institution of Structural Engineers' Conference, at 10, Upper Belgrave Street, London, S.W.1.

May 9 (Thurs.)—S.R. (London) Lecture and Debating Society, at Chapter House, St. Thomas' Street, London Bridge, S.E.1, 5.45 p.m. Annual General Meeting.

May 9-11.—Industrial Transport Association, at Liverpool. Annual Conference.

May 10 (Fri.)—Institution of Mechanical Engineers, Storey's Gate, London, S.W.1, 7 p.m. Informal Meeting.

London Passenger Transport Pooling Scheme

On Tuesday, April 9, the second day of the proceedings before the London Passenger Transport Arbitration Tribunal in connection with the London passenger pooling scheme, the President, Mr. Joshua Scholefield, K.C., devoted considerable attention to the proposed operation of the pool in regard to the joint lines and to main-line services carrying also suburban traffic within the area.

Earlier stages in the hearing were reported on pages 566-7 of our issue March 22, and on page 677 of April 12 we recorded the tribunal's general approval of the scheme subject to further consideration of certain details.

Lord Ashfield gave evidence as to the exhaustive and detailed investigations and inquiries which had been carried out in the preparation of the submitted scheme. He explained why a scheme of this sort was necessary, and said that, had it been possible for the suburban lines of the main-line railways to be separated, he was clearly of the opinion that there would have been a complete financial fusion not only of all the undertakings now included in the L.P.T. Board, but also of the suburban lines of the main-line railways and those of the joint lines. Due to the fact that it was physically impossible to separate the suburban lines (that is the lines worked in the London Transport Area) from the main lines of the four large railway companies, such a financial fusion was impossible, and it was therefore necessary for a scheme to be devised which would as nearly as possible secure to the suburban lines and to the joint lines the same financial results in succeeding years as would have happened if there had been complete financial fusion.

Mr. Scholefield, while expressing general agreement with the pool details as submitted, suggested that one or two minor features merited further consideration. With regard to joint lines in particular, the scheme was designed to include "the whole of the passenger receipts of each of the amalgamated railway companies from any joint line owned jointly by the L.P.T. Board and one or more of the amalgamated railway companies which lies wholly within the L.P.T. Area."

As instancing the way in which the scheme was to work in this respect, Mr. Walter Monckton, K.C., Counsel for the Applicants, referred to the line between Southend and Ealing, which went by way of the Whitechapel and Bow line. That joint line was a suburban line wholly within the area, and the position which would strictly obtain would be that the board would have to pay 50 per cent., which was its proportion of the journey over the joint line, and the whole of the receipts from Whitechapel to Ealing, which were its, into the joint pool, and the L.M.S.R., which would be responsible for the rest of the journey, would

have to pay nothing, either from Southend to Bow or for its 50 per cent. of the joint line.* What was proposed was that the whole of the passenger receipts of the railway company in that case from the joint line which was owned jointly by the L.P.T. Board and the L.M.S.R. should be included. The reason was purely one of accountancy convenience, and the effect of such variation was about 0.006 per cent.

In respect of all the joint lines concerned just over £2,500 in more than 17 miles was involved. As the sum was so small, and the railway companies were prepared to bring that amount into the pool, thereby losing a little, it was felt that the tribunal might take the view, *de minimis*, "It is such a small thing that it is really cheaper to do it in this way than to put the burden on the accountants." Mr. Monckton added that there were four joint lines wholly within the area in which one or other of the amalgamated railway companies had a share with L.P.T. Board. They were the Watford Joint Railway, in which the board and the L.N.E.R. were concerned; the Whitechapel & Bow; the Hammersmith & City Joint line of the L.P.T. Board and the G.W.R.; and the East London Joint, which was leased to the L.P.T. Board, the L.N.E.R., and the Southern Railway.

Mr. Andrew Howie, Joint Accountant of the Southern Railway, explained in evidence that each of the shares of the total pool due to joint lines was allocated to a parent or sponsor company; that was not final ownership but was received in trust for eventual distribution. For instance, the East London joint line share of 0.18845 per cent. was allocated to the L.P.T. Board. Of the total allocation, the joint lines were entitled to 1.92605 per cent. in all. The sponsor took all the receipts and paid all the expenses, and then shared out in accordance with the statutory agreements or Acts of Parliament affecting the line concerned. The L.P.T. Board received beneficially 61.16863 per cent. of the total pool as against 62.87900 per cent. actually taken. The balance of 1.71037 per cent. was received in trust as sponsor on behalf of various joint lines. It was not possible to ignore the existence of joint lines and credit shares direct to

* [It will be recalled that the Act establishing the London Passenger Transport Board requires the board to bring into the pool the whole of its receipts wherever earned, whereas the main-line railways which are parties to the pool are to bring in only those receipts attributable to the conveyance of passengers between any two stations within the area. A passenger booking from a Whitechapel and Bow Railway station to Southend would therefore be exempted from the pool and the L.M.S.R. would not be required to pool even its share of Whitechapel and Bow earnings in respect of such passenger but for the modifications proposed by the present submitted scheme.—ED., R.G.]

owner companies, as the joint lines handled goods traffic and had other sources of revenue not affected by the pool.

Dealing in detail with the East London Railway it was explained that the line extended from Shoreditch to New Cross and thus lay wholly within the London Transport Area. Sections 38 and 39 of the East London Railway Act, 1882, provided for a lease of the line of the East London Railway Company (now taken over by the Southern Railway) to certain other companies at a rent which in effect 56 per cent. of the gross annual receipts from the traffic of the railway subject to a minimum of £30,000. The interest of the lessor under that lease had become vested in the Southern Railway under Section 46 and 57 (2) of the Southern Railway Act, 1925. The interests of the lessees under that lease had now become vested as follow: Southern Railway, 47½ per cent.; London Passenger Transport Board, 35 per cent.; L.N.E.R., 17½ per cent. Under Section 46 of the East London Railway Act, 1882, a Joint Committee had been appointed by the lessees for the management and control of the railway, and under an agreement made on January 29, 1914, between the Metropolitan Railway Company, a predecessor of the London Passenger Transport Board, and the East London Railway Joint Committee, the board now provided and worked the passenger train services on the railway, and the joint committee reimbursed to the board its actual working expenses calculated on a car mile basis. Under the statutory provisions and the agreement, apart from the provisions of the pooling scheme, (a) the gross annual receipts from the traffic of the railway went to the joint committee; (b) the working expenses were incurred by the board, but reimbursed to it by the joint committee; (c) the joint committee paid as rent to the Southern Railway 56 per cent. of the annual gross receipts subject to a minimum payment of £30,000; and (d) the profit or loss of the joint committee was shared by the lessees in proportion to their interests. As a result of an arbitration it was determined what the interests were.

As the standard proportion of this joint committee was found to be 0.18845 per cent. of the total net pooled receipts, this percentage was transferred to the board as sponsor for the joint committee. When the statutory provisions and the agreement were read subject to the provisions of the pooling scheme, the effect would be: (a) the actual passenger receipts from the traffic of the railway after deduction of the appropriate operating allowances would be pooled; (b) the board would be entitled to its standard proportion of the total net pooled receipts which would include the joint committee's standard proportion, the board being the sponsor of the joint com-

mittee; (c) the joint committee in addition to retaining the sums deducted for operating allowances would be entitled to receive from the board as sponsor its standard proportion, namely, 0.18845 per cent. of the total net pooled receipts and this percentage of the total net pooled receipts added to the other revenue of the joint committee would be available to the joint committee for payment of rent and other expenses.

The Operating Allowances Formula

Dealing with the ascertaining of operating allowances under the pool, Mr. Monckton said the formula stated that the operating allowances should be calculated on a mileage basis, namely, loaded train miles, and loaded vehicle miles, and these were the items to be taken into account. If, for instance, the G.W.R. in regard to its railcars had 17.52d. a loaded train mile as its operating allowance, that was an operating allowance expressed per vehicle mile.

Mr. Howie explained that when local trains were run, that was trains which did not go outside the pool area, the total mileage of those trains was charged to the pool, but if a train came from Brighton to London, or went to Brighton from London, or from Manchester to London, and that train called at pool stations for part of its journey, working only partly for the pool, a formula had been devised to meet that particular circumstance. It began with a basic charge of 20 per cent. of the rate per mile for every train making one pool station stop, other than the terminal point. Then 5 per cent. was charged for every additional pool station stop, with a maximum charge of 80 per cent. for any such through train.

At a later stage in the proceedings, Mr. Scholefield suggested the incorporation of these percentage figures in the scheme, but Mr. Monckton said the parties to the pool were not prepared to agree to this, as they did not wish to bind themselves for all time to a formula which might not work so accurately and smoothly as anticipated.

BRITISH STANDARD SPECIFICATIONS FOR ASPHALTIC ROAD SURFACING.—The following B.S. specifications have just been issued by the British Standards Institution:—

No. 348-1935. Compressed rock asphalt (Superseding No. 348-1928.)

No. 594-1935. Rolled asphalt; fluxed lake asphalt and asphaltic bitumen; hot process. (Superseding Nos. 342, 343, 344 and 345.)

No. 595-1935. Rolled asphalt; fluxed natural asphalt and asphaltic bitumen; hot process.

No. 596-1935. Mastic asphalt surfacing; fluxed lake asphalt and asphaltic bitumen; hot process. (Superseding No. 346-1928.)

No. 597-1935. Mastic asphalt surfacing, fluxed natural asphalt and asphaltic bitumen; hot process.

Copies may be obtained from the British Standards Institution, 28, Victoria Street, S.W.1, at the following prices: Nos. 594 and 595-1935, 5s. 3d each, post free; Nos. 348, 596, and 597 2s. 2d. each, post free.

L.N.E.R. Assessment

The Railway Assessment Authority decided on April 27 that a nil assessment should appear in the completed valuation roll of the undertaking as a whole in England and Wales of the London & North Eastern Railway Company. The authority had previously fixed an assessment of £3,500,000 in the draft roll. Representations were recently made that a nominal figure should be substituted, and a figure £5,000,000 was put forward by several local authorities.

The Chairman of the authority in giving the decision explained that at the time when the proposal to fix the £3,500,000 was made there had been no decision upon the construction of the Act of 1930, and that the authority was free to act upon what it thought was the true intent and meaning of subsections (1) and (2) of Section 4 of the Act. It then decided unanimously that a fair and just division of the net receipts of £10,904,195 as between landlord and tenant was to give the tenant £7,400,000 odd and the land-

lord £3,500,000. In view, however, of the decision of the Railway and Canal Commission in the Southern Railway case, the authority was compelled to depart from its construction of the Act. On the principle applied by the commission in the Southern case, the estimated value of the tenant's chattels (originally put by the L.N.E.R. Company at £104,547,742 and afterwards revised by it to £95,200,388) was not likely to be proved at less than £69,000,000. Further the percentage allowance of 15 per cent. made applicable to the tenant's capital in the Southern case, could hardly, on the facts known, be less in the case of the L.N.E.R. Company. After adding the 15 per cent. interest (£10,350,000) to the tenant's capital, and a share of the receipts earned without the use of tenant's capital (as was allowed in the Southern case), the total tenant's share more than absorbed the whole of the net receipts, and the net annual value was, therefore, nil, and the roll had been amended accordingly.

L.M.S.R. Ambulance Finals

This year the final competition of the L.M.S.R. Ambulance Centre was held out of London for the first time, the event taking place at the Adelphi Hotel, Liverpool, on Tuesday last, April 30. A large assembly watched the nine participants in the team test, which required the treatment of a stage-hand supposed to have fallen from a ladder while adjusting a curtain, sustaining head injuries and a fractured leg. As usual, the individual and *viva voce* examinations were held in private. The high standard of efficiency attained by all the teams is demonstrated in the closeness of the result, which was as follows (marks are out of a total of 410):—

Agcroft (339); Bushbury (332); Warrington (329); Bradford (324); Bolton (320); Liverpool (319); Wolverton (317); Crewe (313); Ruthin (306).

The shield for the preliminary competition went to the Crewe team, which was also winner of the finals in 1933. Among the other awards was the presentation of a clock to Mr. J. E. Rogers, of Pres, for the most meritorious act of the year.

Mr. G. L. Darbyshire (Chief Officer for Labour and Establishment, L.M.S.R.) took the chair at the prize giving in the afternoon. He said that railwaymen had been pioneers in first aid work, and there were now between twenty-seven and thirty thousand passed ambulance workers on the L.M.S. system, while students numbered eight or nine thousand. These men not only exercised their skill on the railway but went out in their spare time and performed valuable work in cases of road accidents.

The prizes were then presented by Mrs. Fielden, who was accompanied on the platform by Mr. E. B. Fielden (Deputy Chairman, L.M.S.R.). After the presentation, a vote of thanks to Mr. and Mrs. Fielden and to Mr. Darbyshire was proposed by the Mayor of Bootle, who referred to the interest taken by the L.M.S. company in the welfare of its employees, and considered that it was the promotion of ambulance work among railway servants which had made the greatest impression upon the general public. Mrs. Fielden, in responding, said that the railway ambulance movement deserved to be given the widest possible publicity.

Mr. Darbyshire proposed a vote of thanks to Doctors J. Baird-Aitken, W. H. Maguire and J. Welsh, who had acted as judges, and brief replies were made by all three. Dr. Baird-Aitken reminded the spectators that it was by no means only as a precaution against the railway's own mishaps that men were trained in ambulance work, but to safeguard the travelling public from the results of its own thoughtlessness in alighting from moving trains and so on.

The Lord Mayor of Liverpool attended a luncheon at the Adelphi Hotel in connection with the finals, and the Mayor and Mayoress of Bootle were present at the prize giving. L.M.S. directors and officers included:—

Messrs. E. B. Fielden, (Deputy-Chairman); G. L. Darbyshire (Chief Officer for Labour and Establishment); W. E. C. Lazenby (Assistant Chief Officer for Labour and Establishment); F. R. Hauxwell (District Goods Manager, Liverpool); C. Johnstone (District Passenger Manager, Liverpool).

NOTES AND NEWS

Ottoman Railway from Smyrna to Aidin.—We are officially informed that a contract was signed on May 1 by a representative of the Ottoman Railway Company from Smyrna to Aidin and the Minister of Public Works for the purchase of the company's undertaking by the Turkish Government. Certain financial details still remain to be adjusted.

Bishop's Castle Railway Closed.—Following a decision by the Master in Chancery, the Bishop's Castle Railway was closed on April 20. This 10-mile standard gauge line has been in the hands of a receiver for many years. The district is now served by joint G.W.R. and L.M.S.R. motor lorries which deliver parcels and goods from Craven Arms station. Buses provide passenger services in the neighbourhood.

Canadian Pacific Earnings.—Gross earnings of the Canadian Pacific Railway for the month of March, 1935, amounted to \$9,516,000, a decrease of \$430,000 compared with March, 1934, and working expenses were \$8,469,000, an increase of \$42,000, leaving net earnings \$472,000 lower, at \$1,047,000. Aggregate gross earnings for the quarter January 1 to March 31, 1935, amounted to \$26,439,000, a decrease of \$1,048,000 compared with the first quarter of 1934, and the aggregate net earnings of \$2,101,000 showed a falling off of \$1,125,000.

Canadian National Earnings.—For the month of March, 1935, gross earnings of the Canadian National Railways amounted to \$13,842,281, a decrease of \$436,367 in comparison with March, 1934. Operating expenses (\$12,745,860) at the same time advanced by \$66,170, leaving net earnings \$502,537 lower, at \$1,096,421. Aggregate gross earnings from January 1 to March 31, 1935, were \$38,376,400, an improvement of \$1,009,958 on the first three months of 1934, and there were aggregate net earnings of \$487,362, an increase of \$422,360.

New London-Rome-Brindisi Air Service.—By a new air service which began on Sunday, April 28, Rome can be reached from London in less than 9 hours, and Brindisi in 11½ hours. These times compare with approximately 40 hours to Rome, and approximately 50 hours to Brindisi, if the journey is made by the fastest surface transport. This new air service, operated by Imperial Airways with 4-engined express air liners, is to continue until September 30. It will fly twice weekly in each direction, services leaving London for Brindisi on Sundays and Thursdays, and from Brindisi for London on Saturdays and Wednesdays. To Rome the fare is £18. The fare by first-class *de luxe* boat-and-train journey from London to Rome, with sleeper from Calais, costs just over £20. The facilities provided by the new

service will also be used in transporting between London and Brindisi certain outward-bound traffic for Australia and certain traffic to and from South Africa. But it should be emphasised that the train link will still remain the Paris-Brindisi stage for the bulk of our Empire traffic.

Southern Railway Ambulance Competitions.—Waterloo "A" team won the Southern Railway ambulance competitions at Cannon Street Hotel on April 30, with 300 points. Horsham No. 1 (289 points) was second, and Horsham No. 2 (266 points) third. The other teams in the final were Yeovil "B"; New Cross Gate, No. 2; Bricklayers' Arms, No. 1; Eastleigh Running Shed; Southampton West No. 1; Waterloo "B"; Barnstaple No. 2; Ashford Works "A"; Folkestone Harbour. The prizes were presented by Mr. Robert Holland-Martin.

L.N.E.R. (King's Cross) Literary Society Meeting.—Mr. J. Lees (Assistant Superintendent, Southern Area) presided at the annual general meeting of the L.N.E.R. (King's Cross) Literary Society on April 26. After a brief survey of the year had been presented by the chairman, the report and accounts were unanimously adopted, and officers for the ensuing year were elected. Sir Murrough J. Wilson, K.B.E. (Deputy Chairman, L.N.E.R.) and Messrs. C. K. Bird (Assistant Goods Manager), R. J. M. Inglis (Assistant Engineer, Construction) and J. C. L. Train (Assistant Engineer, Western District, Scottish Area) were elected Vice-Presidents.

Great Eastern Amateur Athletic Association.—The annual dinner and concert of the Great Eastern Amateur Athletic Association was held at the Liverpool Street Hotel on April 27, under the presidency of Sir Charles Batho, Bart. After the dinner, the toast of the Directors and Officers of the L.N.E.R. was proposed by Mr. Bizley, who referred in particular to the work of the Chairman of the Association, Mr. H. H. Mauldin (Superintendent, Eastern Section, L.N.E.R.). Sir Charles Batho and Mr. C. H. Newton (Chief Accountant, L.N.E.R.) replied to the toast. Mr. J. C. L. Train (Engineer, Western District, Scottish Area) proposed "The Great Eastern Amateur Athletic Association," to which Mr. Mauldin replied. Mr. J. McLaren (Secretary, L.N.E.R.) proposed a vote of thanks to Sir Charles Batho.

Associated Humber Steamship Lines.—The management of the Goole Steam Shipping (L.M.S.), L.N.E.R. Grimsby steamship services, Grimsby, Hull and Netherlands Steamship Co. Ltd., and Wilsons & North Eastern Railway Shipping Company, Hull, announce that in the near future the four steamship lines will be operated as Associated Humber Lines under a

single management, with headquarters at Alexandra Chambers, Mytongate, Hull. Until further notice, there will be no alteration to existing arrangements at the ports, and sailings will operate as at present advertised. Traders may rest assured that their traffic will continue to receive individual attention as in the past. One of the principal objects of the new arrangements is to maintain the efficiency of the whole of the Humber steamship services.

Welding Symposium.—In connection with the symposium on the welding of iron and steel which was opened yesterday and continues to-day, an exhibition of welding has been staged at the Science Museum, South Kensington. The exhibition, which is to remain open till May 15, is accompanied by demonstrations and films. Separate sections are devoted to welding by the atomic hydrogen, the electric arc, the electric resistance, and the oxy-acetylene processes. Certain welding apparatus is shown, but greater prominence is given to specimens of welded joints and structures. Test pieces and photographs of important fabrications complete the exhibits. The symposium has been organised by the Iron and Steel Institute at the suggestion of the Department of Industrial Research.

C.P.R. Prospects.—Mr. E. W. Beatty, presiding at the annual meeting in Montreal on May 1 of the Canadian Pacific Railway Company, said that last year gross earnings increased 9.9 per cent. Working expenses, as a result of careful control, increased 6.7 per cent. only, and net earnings increased by \$4,960,729, or 44 per cent. of the increase in gross earnings. The ratio of working expenses (including taxes) to gross earnings declined more than two points, and now stood at 80.58 per cent., the lowest ratio since 1930. With the favourable turn to the world wheat situation, which would appear probable, and a return of normal climatic conditions to the southern prairies, he believed they might look forward with confidence to steady progress towards recovery.

G.W.R. Ambulance Presentation at Swindon.—Mr. Charles Hambro, Deputy-Chairman of the G.W.R., visited Swindon on the evening of April 12 to present competition trophies and examination awards to ambulance workers in the division. Mr. J. Auld, Principal Assistant to the Chief Mechanical Engineer, presided over a large and representative gathering at the Baths Hall, and was supported by the Mayor of Swindon (Councillor F. T. Hobbs); Messrs. F. W. Hawksworth, Assistant to Chief Mechanical Engineer; J. R. W. Grainge, Electrical Assistant; F. C. Hall, Locomotive Running Superintendent; R. A. G. Hannington, Locomotive Works Manager; E. T. J. Evans, Carriage and Wagon Works Manager; G. F. Boxall, Assistant Stores Superintendent; W. A. Pellow, Divisional Locomotive Superintendent, Bristol;

K. J. Cook, Assistant Works Manager, and other local officers. In the course of an interesting and cheerful speech Mr. Hambro said how happy he was to meet so many members of the staff at Swindon, which he regarded as the heart of the Great Western Railway. Speaking of the Order of St. John, he said that the original members of the society were great soldiers, but it was a satisfaction to know that the Order was now one of the greatest organisations for the relief of suffering. Although the G.W.R. was a hundred years old, it was a young organisation compared with the Order. During recent years the company had been through difficult times, and without the co-operation of the officials and staff from the top to the bottom it could not have been brought to its present position. "We have still a long way to go yet," said Mr. Hambro, "but we at Paddington want to thank you for the way you have co-operated with us during the past two or three years and for making it possible for us to see daylight." Mr. Hambro congratulated Mr. L. G. Bretsch, the divi-

sional ambulance secretary, on all he had done for the success of the division. In proposing the toast of the success of the G.W.R. ambulance classes, the Mayor said it was 40 years ago when the Association came into being, and now there were more than 1,000 efficient ambulance men at Swindon. The audience was kept in a merry mood by the contributions of the "Melody Five," assisted by Chick Fowler, the B.B.C. entertainer of Gloucester.

Road Accidents.—The Ministry of Transport return for the week ended April 27 of persons killed or injured in road accidents is as follows. The figures in brackets are those for the corresponding week of last year:—

	Killed, including deaths resulting from previous accidents		Injured	
England...	109	(112)	3,665	(3,535)
Wales ...	7	(2)	179	(149)
Scotland...	10	(12)	336	(328)
	126 (126)		4,180 (4,012)	

The total fatalities for the previous week were 103, as compared with 133 for the corresponding period of last year.

British and Irish Railways Stocks and Shares

Stocks	Highest 1934	Lowest 1934	Prices	
			May 1, 1935	Rise Fall
G.W.R.				
Cons. Ord. ...	66½	48½	50	—
5% Con. Prefce. ...	118	109	117½	+1½
5% Red. Pref.(1950) ...	115	107	111½	+1
4% Deb. ...	117	105	113	—
4½% Deb. ...	119	109	115½	—
4½% Deb. ...	129½	115½	124½	—
5% Deb. ...	135	126½	136½	—
2½% Deb. ...	75	64	78	+2
5% Rt. Charge ...	1347½	123½	130½	—
5% Cons. Guar. ...	132¾	121½	128	—
L.M.S.R.				
Ord. ...	30½	19½	20	+½
4% Prefce. (1923) ...	64½	41	51½	+2½
4% Prefce. ...	87	69½	82	+1
5% Red. Pref.(1955) ...	107	92½	101½	+1
4% Deb. ...	114½	100½	107	+1
5% Red. Deb.(1952) ...	118½	111½	114½	* -2
4% Guar. ...	106½	96½	102	—
L.N.E.R.				
5% Pref. Ord. ...	24½	13½	13½	+½
Def. Ord. ...	11½	6½	6½	+½
4% First Prefce. ...	76	59½	62	+2
4% Second Prefce. ...	47	25½	25½	+1½
5% Red. Pref.(1955) ...	94½	80	81½	—
4% First Guar. ...	104	92	100	+1
4% Second Guar. ...	97½	86½	92	+1½
3% Deb. ...	90	74½	81	+1
4% Deb. ...	114	99½	105	+1
5% Red. Deb.(1947) ...	117	108	112½	—
4½% Sinking Fund Red. Deb. ...	111½	105½	110½	—
SOUTHERN				
Pref. Ord. ...	90	63½	86	+2
Def. Ord. ...	32½	19	25	+1
5% Prefce. ...	118½	107½	117½	+1½
5% Red. Pref.(1964) ...	115½	107½	114½	—
5% Guar. Prefce. ...	132	120½	128	—
5% Red. Guar. Pref. (1957) ...	119½	113	117½	—
4% Deb. ...	116½	103½	112½	+½
5% Deb. ...	134	124½	135½	+1
4% Red. Deb. ...	113½	105½	111½	—
1962-67				
BELFAST & C.D.				
Ord. ...	6	5	5	—
FORTH BRIDGE				
4% Deb. ...	110	100	109½	—
4% Guar. ...	110	100	108½	—
G. NORTHERN (IRELAND)				
Ord. ...	9¾	4½	9	—
G. SOUTHERN (IRELAND)				
Ord. ...	25	12½	25	—
Prefce. ...	21½	13½	26½	—
Guar. ...	48	39	58	-¼
Deb. ...	67	59	73½	+2½
L.P.T.B.				
4½% "A" ...	126	115	122½	+1
5% "A" ...	135½	124½	132½	+1
4½% "T.F.A." ...	113½	107½	112	—
5% "B" ...	131½	118	127½	+1
5% "C" ...	97	73	100	+1
MERSEY				
Ord. ...	15½	7	12	—
4% Perp. Deb. ...	93½	82½	95½	—
3% Perp. Deb. ...	66½	61½	69½	—
3% Perp. Prefce. ...	54	44½	52½	—

* ex dividend

British and Irish Traffic Returns

GREAT BRITAIN	Totals for 17th Week			Totals to Date		
	1935†	1934	Inc. or Dec.	1935	1934	Inc. or Dec.
L.M.S.R. (6,926½ mls.)	£	£	£	£	£	£
Passenger-train traffic...	479,000	428,000	+ 51,000	6,784,000	6,650,000	+ 134,000
Merchandise, &c. ...	393,000	461,000	- 68,000	7,542,000	7,570,000	- 28,000
Coal and coke ...	152,000	206,000	- 54,000	4,327,000	4,406,000	- 79,000
Goods-train traffic ...	545,000	667,000	- 122,000	11,869,000	11,976,000	- 107,000
Total receipts ...	1,024,000	1,095,000	- 71,000	18,653,000	18,626,000	+ 27,000
L.N.E.R. (6,339 mls.)						
Passenger-train traffic...	314,000	262,000	+ 52,000	4,468,000	4,354,000	+ 114,000
Merchandise, &c. ...	295,000	331,000	- 36,000	5,221,000	5,341,000	- 120,000
Coal and coke ...	182,000	229,000	- 47,000	4,001,000	4,182,000	- 181,000
Goods-train traffic ...	477,000	560,000	- 83,000	9,222,000	9,523,000	- 301,000
Total receipts ...	791,000	822,000	- 31,000	13,690,000	13,877,000	- 187,000
G.W.R. (3,749½ mls.)						
Passenger-train traffic...	202,000	180,000	+ 22,000	2,833,000	2,827,000	+ 6,000
Merchandise, &c. ...	144,000	186,000	- 42,000	3,003,000	2,997,000	+ 6,000
Coal and coke ...	63,000	98,000	- 35,000	1,750,000	1,826,000	- 76,000
Goods-train traffic ...	207,000	284,000	- 77,000	4,753,000	4,823,000	- 70,000
Total receipts ...	409,000	464,000	- 55,000	7,586,000	7,650,000	- 64,000
S.R. (2,172 mls.)						
Passenger-train traffic...	291,000	258,000	+ 33,000	4,235,000	4,141,000	+ 94,000
Merchandise, &c. ...	53,500	69,000	- 15,500	992,000	1,066,500	- 74,500
Coal and coke ...	23,500	27,000	- 3,500	560,000	605,500	- 45,500
Goods-train traffic ...	77,000	96,000	- 19,000	1,552,000	1,672,000	- 120,000
Total receipts ...	368,000	354,000	+ 14,000	5,787,000	5,813,000	- 26,000
Liverpool Overhead ...	1,266	1,015	+ 251	18,696	18,258	+ 438
(6½ mls.)						
Mersey (4½ mls.) ...	4,451	3,918	+ 533	70,126	71,553	- 1,427
*London Passenger Transport Board ...	574,800	547,200	+ 27,600	22,869,300	22,447,400	+ 421,900
IRELAND						
Be. fast & C.D. pass.	3,722	1,872	+ 1,850	31,333	31,535	- 202
(80 mls.)						
goods	438	496	- 58	8,240	9,029	- 789
total	4,160	2,368	+ 1,792	39,573	40,564	- 991
Great Northern (543 mls.)						
pass.	13,600	7,250	+ 6,350	144,800	130,250	+ 14,550
goods	7,100	9,650	- 2,550	145,600	143,100	+ 2,500
total	20,700	16,900	+ 3,800	290,400	273,350	+ 17,050
Great Southern (2,124 mls.)						
pass.	28,800	19,488	+ 9,312	337,679	332,039	+ 5,640
goods	31,820	32,766	- 946	601,652	547,247	+ 54,405
total	60,620	52,254	+ 8,366	939,331	879,286	+ 60,045

* 43rd week, the receipts for which include those undertakings not absorbed by the L.P.T.B. in the corresponding period last year; last year's figures are, however, adjusted for comparative purposes
† Easter Monday, 1935

CONTRACTS AND TENDERS

Resignalling at Edinburgh (Waverley West), L.N.E.R.

The Siemens & General Electric Railway Signal Co. Ltd. has received a contract from the L.N.E.R. for the supply and installation of a complete power signalling system at Edinburgh (Waverley West). The scheme will include an all-electric interlocking frame with 230 levers, d.c. point machines and detectors, colour light running signals, banner type shunt signals, S.G.E. blind type route indicators, together with the necessary a.c. control relays, train describers and power plant. The track circuits will be a.c. condenser fed throughout.

Underframes for L.M.S.R.

In addition to the order secured by the Metropolitan-Cammell Carriage & Wagon Co. Ltd. for 50 steel underframes for type BR containers for the L.M.S.R., as recorded in this column in our issue of last week, orders have also been placed by the L.M.S.R. with the Birmingham Railway Carriage & Wagon Co. Ltd. for 40 four-wheeled vacuum-braked steel underframes for type FX containers and with Hurst Nelson & Co. Ltd. for 30 of the same type for the same traffic. The fact that the L.M.S.R. was increasing the stock of container wagons was recorded in this column in the April 12 issue.

The Birmingham Railway Carriage & Wagon Co. Ltd. has received an order from the Crown Agents for the Colonies for 90 four-wheeled covered goods wagons for the 4-ft. 8½-in. gauge lines of the Palestine Railways. Orders have also been received by the Birmingham Railway Carriage & Wagon Co. Ltd. from the Crown Agents for six 4-ft. 8½-in. gauge 30-ton bogie flat wagons for the same railway, and for 15 underframes for 20-ton bogie wagons for the Leopoldina Railway.

Chas. Roberts & Co. Ltd. has received an order from the Crown Agents for the Colonies for six 30-ton bogie oil tank wagons for the 4-ft. 8½-in. gauge lines of the Palestine Railways.

The General Electric Co. Ltd. has received a contract from the L.N.E.R. for a twelve month's supply of Osram lamps.

J. Lang & Sons Ltd., has received an order for two motor-driven sliding, surfacing and screwcutting lathes for the Buenos Ayres Western Railway.

Murex Welding Processes Limited has received an order from the South Indian Railway, to the inspection of Messrs. Robt. White & Partners, for one two-operator electric welding plant to be driven by a Lister diesel engine.

Guest, Keen, Williams Limited has secured orders from the Indian Stores Department for 360,000 metre-gauge and 350,000 broad-gauge dogspikes at prices respectively of Rs. 21,809 and Rs. 24,650 free delivery, and 2,000 buffer-cases at Rs. 21,406 free delivery.

Frank How & Co. Ltd. has received an order for 25,000 gallons of lubricating oil for the Palestine Railways.

The British Mannesmann Tube Co. Ltd. has received an order for 1,000 Impervico steel boiler tubes for the Buenos Ayres Western Railway.

The Great Western Railway has placed orders as follow:—

Cowan Sheldon & Co. Ltd.: 70-ft. turntable for Old Oak Common locomotive shed.

Cleveland Bridge & Engineering Co. Ltd.: Supply and erection of pair of dock gates at Port Talbot docks.

W. H. Allen, Sons & Co. Ltd.: Electrically-driven pumping plant for Prince of Wales Lock, Swansea.

T. Robinson & Son Ltd.: Sawdust and chip extracting plant for Hayes crossting depot.

General Electric Co. Ltd.: Automatic telephone exchange for Old Oak Common.

Frigidaire Limited: Electrical refrigerating plant for new restaurant and kitchen cars.

Wallace & Tiernan Limited: Chlorinating plant for Manor House Hotel, Moretonhampstead.

For road transport vehicles as follow:

Scammell Lorries Limited: Five three-ton Scammell trailer chassis.

Taskers Limited: Five trailer chassis.

Rootes Limited: Five three-ton tractors.

Morris Garages Limited: Five three-ton Morris chassis and cabs.

For machines for Swindon Works:

C. Churchill & Co. Ltd.: Vertical milling machine.

Butler Machine Tool Co. Ltd.: Axlebox planing machine.

Drummond (Sales) Limited: High-speed lathe.

W. Gardner & Sons Ltd.: Soap-mixing machine.

Beyer-Garratt Locomotive for South Africa

Beyer, Peacock & Co. Ltd. has received an order from the Consolidated Main Reef Mines & Estate Limited, Johannesburg, for one Beyer-Garratt locomotive of the 2-6-2 + 2-6-2 wheel arrangement, for the 3-ft. 6-in. gauge. This engine, which will be built to a 14-ton axleload, will have a tractive effort at 85 per cent. boiler pressure of 45,500 lb.

D. Wickham & Co. Ltd. has received the following orders:—one No. 17A petrol-driven gang trolley for the Buenos Aires Provincial Railway; one No. 17A trolley with special low-loading platform trailer for conveying motor cars on the Lower Zambesi bridge, for the Central African Railway; one No. 17A trolley with trailer and one No. 8 light inspection railcar for the Midland Uruguay Railway; one No. 8 light inspection railcar for the North Western Uruguay Railway; and one No. 17A gang trolley for a Chinese railway.

Electrical Manufacturers' Pool Information

Certain electrical manufacturers have agreed to pool information and technical designs to assist in the standardisation of the electrical equipment for rolling stock in this country. A company has been registered for this purpose under the title of Associated Manufacturers of Electric Traction Equipments Limited, in which the following companies are jointly interested: British Thomson-Houston Co. Ltd.; Crompton Parkinson-Allen West & Co. Ltd.; English Electric Co. Ltd.; General Electric Co. Ltd.; and Metropolitan-Vickers Electrical Co. Ltd. Reference is made to

this development elsewhere in this issue and in our *Electric Railway Traction Supplement* this week.

The Hunslet Engine Co. Ltd. has received an order from the Bengal North Western Railway for six pairs of frameplates for locomotives, to the inspection of Messrs. Rendel, Palmer & Tritton.

Orders for China

The Chinese Government Purchasing Commission on behalf of the Ministry of Railways, China, has placed orders as follow:—

Tangyes Limited: Two centrifugal pumps.

C. S. Milne & Co. Ltd.: Acetylene lamps.

W. & T. Avery Limited: Eight locomotive portable balancing machines.

Henry Berry & Co. Ltd.: Locomotive drop pit jack.

Hancock & Co. (Engineers) Ltd.: Oxy-acetylene welding plant.

C. M. Hill & Co.: High-speed cold sawing machine.

Merryweather & Sons Ltd.: Portable fire pump.

C. M. Hill & Co.: Boiler proving pump.

W. & T. Avery Limited: Weighing machines.

Fellows Brothers Limited: Traversing screw jacks.

Edge & Sons Limited: Crane chain.

D. Mitchell & Co. Ltd.: Lathes.

Fredk. Town & Sons: Drilling machines.

C. M. Hill & Co.: Shearing machine.

Ormerod Shapers Limited: Shaping machines.

Reiss Brothers Limited: Steam hammer.

A. Balfour & Co. Ltd.: Engineers' tools.

Easterbrook Allard & Co. Ltd.: Engineers' tools.

Thomas White & Sons Limited: Circular saw bench.

Summerskill Brothers: Planing machine.

Alldays & Onions Limited: Smiths hearths, &c.

Glenfield & Kennedy Limited: Pillar water cranes and sluice valves.

Stanton Ironworks Co. Ltd.: Cast iron pipes.

C. M. Hill & Company: Grindstone.

Dempster Moore & Co. (Engineers) Ltd.: Tool grinding machine.

Dunlop Rubber Co. Ltd.: Flexible suction hose pipe.

The whole of these orders are to the inspection of the consulting engineers, Messrs. Fox & Mayo.

J. Baker & Bessemer Limited has received an order for 600 pairs of wagon wheels and axles for the Bombay, Baroda & Central India Railway, to the inspection of Messrs. Rendel, Palmer & Tritton.

Davy Bros. Ltd. has received an order for a complete forging and rolling plant for the production of 36,000 tons of railway tyres a year for the U.S.S.R. The plant will include a 3,000-ton hydraulic press, roughing and finishing mills, marking and rectifying presses, charging machines, hydraulic pumps and accumulators, and other auxiliary machinery.

R. & W. Hawthorn, Leslie & Co. Ltd. has received an order for three steel locomotive fireboxes for the United Railways of the Havana and Regla Warehouses Limited.

Egyptian Enquiries

The Egyptian State Railways Administration invites tenders, receivable at the General Management, Cairo, by the dates named, as follow:—

60,000—100,000 steel sleepers and accessories (May 4).

15,000 boiler tubes (May 8).

Signalling materials (May 9).

100 Sets barriers for level crossings (May 11).

Three or four replacement locomotive boilers (May 18).

Mild steel rounds required during one year (May 21).

200,000 kilos, galvanised line wire (May 23).

Signalling materials (June 1).

1,100 metric tons rolling stock oils (June 11).

Also receivable at the office of the Superintendent of Stores, Saptieh, Cairo, on the dates named, as follow:—

30,000 kilos, internal combustion engine oil (May 11).

12,000 kg. bronze phosphor wire (May 18).

Bolts and nuts (May 25).

950 Helical springs for long type buffers (June 1).

OFFICIAL NOTICES

Bengal-Nagpur Railway Company Limited

THE Directors are prepared to receive Tenders for:—

1,000 PAIRS ROLLED DISC CENTRE TYRED WHEELS WITH STEEL AXLES.

Specification and Form of Tender can be obtained at the Company's Offices, 132, Gresham House, Old Broad Street, London, E.C.2, on or after Monday, 29th April, 1935.

A fee of 20s. will be charged for each copy of the Specification, which is not returnable. Tenders must be submitted not later than noon on Thursday, 9th May, 1935.

The Directors do not bind themselves to accept the lowest or any Tender, and reserve to themselves the right of reducing or dividing the order.

By Order of the Board,

P. W. GIBBS,
Assistant Secretary.

PATENTS for Inventions, Trade Marks, Advice, Handbook, and consultations free. King's Patent Agency, Ltd. (B. T. King, C.I.M.E.). Registered Patent Agent, G.B., U.S., and Canada, 146a, Queen Victoria Street, London, E.C.4. 49 years' references. Phone City 6161.

Commissioners for the Port of Rangoon

WANTED, as CHAIRMAN of the COMMISSIONERS for the PORT of RANGOON, a gentleman with wide practical experience in port, railway or other business administration; under 45 years of age; salary Rs. 3,000/- a month rising by annual increments of Rs. 125/- to Rs. 3,500/- with a free house. Applications should be addressed, not later than 31st May, 1935, to MESSRS. OGILVY, GILLANDERS & Co. (Reference R.136), 5, Lothbury, London, E.C.2, from whom further particulars regarding the appointment may be obtained by forwarding an addressed envelope to them.

THE Proprietor of British Patents Nos. 198,875, dated May 2, 1922, and 171,542, dated September 7, 1920, both relating to "Improvements in Underframes for Railway and like Vehicles," and No. 329,720, dated March 1, 1929, relating to "Improvements in Railway Rolling Stock Underframe Structures," is desirous of entering into arrangements by way of a Licence or otherwise on reasonable terms for the purpose of exploiting the above Patents and ensuring their practical working in Great Britain.—Inquiries to B. Singer, Steger Building, Chicago, Illinois.

South Indian Railway Company Limited

THE Directors are prepared to receive Tenders for the supply of:—

STEEL TYRES FOR LOCOMOTIVE ENGINES AND TENDERS.

Specifications and Forms of Tender will be available at the Company's Offices, 91, Petty France, Westminster, S.W.1.

Tenders, addressed to the Chairman and Directors of the South Indian Railway Co. Ltd., marked "Tender for Steel Tyres," with the name of the firm tendering, must be left with the undersigned not later than 12 noon on Friday, the 17th May, 1935.

The Directors do not bind themselves to accept the lowest or any Tender.

A charge, which will not be returned, will be made of 10s. for each copy of the Specification.

Copies of the drawings may be obtained from the Company's Consulting Engineers, Messrs. Robert White & Partners, 3, Victoria Street, Westminster, S.W.1.

A. MUIRHEAD,
Managing Director.

91, Petty France,
Westminster, S.W.1.
1st May, 1935.

Special Wagons for Conveying Pulverised Coal

A design developed by Charles Roberts & Co. Ltd., of Wakefield

In recent years the application of pulverised coal firing to boilers and metallurgical furnaces has made very great progress in this country, and it has been found that where there are a number of comparatively small units to fire, the centralised bin system has many advantages over small unit pulverisers; metallurgical furnaces so fired are extremely flexible and easily controlled, having many of the advantages of oil and gas for, in the majority of cases, lower costs. A grinding plant for dealing with raw coal necessitates a considerable capital outlay and in addition there is a very large potential demand for pulverised coal ready pulverised at the pit head, but hitherto the difficulty has been the conveyance of this material in bulk.

For many years pulverised coal has been transported in bulk in Germany in railway tank wagons, and Chas. Roberts & Co. Ltd. has now purchased the sole licence from one of the German manufacturers for the right to utilise their patents in Great Britain. The firm has constructed a tank wagon embodying standard Railway Clearing House practice, fitted with two containers incorporating the German patents, and this vehicle is now regularly running over the main lines, bringing pulverised coal supplied by H. Tollemache & Co. Ltd., which Chas. Roberts & Co. Ltd., is burning in its forge furnaces from a central bin.

In this wagon the underframe is built up of mild steel channels and angle and plate knees riveted together, of the following overall dimensions:—

Length over headstocks ...	18 ft.
Length over buffers ...	21 ft.
Width between solebars ...	6 ft. 3 in.
Wheelbase ...	10 ft. 6 in.
Overall height of wagon ...	10 ft. 11 in.

The main underframe sections are in 10 in. x 3½ in. x ¾ in. rolled steel channel, gusseted where necessary to

provide seating for the fuel containers. The containers are of conical shape, built up of mild steel plates and plate gussets and supports, electrically welded throughout and of the following dimensions:—

Outside diameter ...	8 ft. 3 in.
Depth inside ...	7 ft. 9 in.
Capacity ...	200 cu. ft.

In practice the wagon regularly carries between 7 tons 15 cwt. and 8 tons.

Each container is firmly mounted on, and suitably stayed to, the underframe and is provided with a ladder inside in addition to that on the outside. The container fittings include an 18-in. diameter manhole with pressure type lid, pressure gauge, relief valve, vent, and the necessary discharge piping. This piping is so arranged that, during discharge, air pressure is

acting on the top of the mass of fuel as well as at the bottom, and in addition the piping is valved to enable one or both containers to be discharged simultaneously. The running, buffing, draw and brakegear is throughout in accordance with R.C.H. drawings, except that short drawbars are fitted, since it is, of course, impossible to fit continuous drawgear to a vehicle of this description. The discharge of the wagon into the bin is an exceedingly simple process, and is accomplished by connecting two flexible pipes, one of them admitting air at 30 lb. per sq. in. pressure, to the wagon. As soon as the air is turned on the coal starts to discharge through a large pipe, and in twenty minutes both containers are quite empty. The process is very clearly illustrated in the accompanying illustration, which shows the wagon and the two hoses admitting the air and taking away the coal; the bin can be clearly seen in the background, with the feeding mechanism underneath.



Electric Railway Traction

Rectifiers for Regeneration

FOR the first time in railway service, so far as we are aware, mercury arc rectifiers are to be arranged for inverted operation, that is, they will convert direct current into alternating current. This feature is embodied in the order for 18 rectifiers placed by the South African Railways with the British Thomson-Houston Co. Ltd. The installation will comprise two rectifiers in each substation, one for feeding the track with d.c. and one for feeding regenerated d.c. back into the transmission system as a.c., but the two units will be interchangeable in function. The inverted operation is effected by grid control, and for this the d.c. busbar volts must be greater than the average d.c. voltage of the rectifier, and the grid control must be arranged to ignite the arc during the reverse polarity of the anodes. The rectifier current must flow from the anode to the cathode, which is effected by reversing the d.c. connections. The arc is transferred from one anode to the next through grid control, and the current, flowing through each anode in turn, corresponds to the phases of the transformer and induces a.c. in the secondary (normally the primary) of the transformer, and feeds power into the a.c. system. The practicability of inverted operation depends essentially on grid control to determine the sequence and timing of the arc on the various anodes. The regenerated voltage from the traction motors decreases with the speed, and it can be followed by altering the grid control; a steady current can thus be maintained down to zero volts which corresponds to a dead stand. The success which has attended the experimental adoption of grid-controlled inverted operation in units of large power seems to ensure the immediate success of the South African applications, and the system as a whole will doubtless become of great importance to d.c. electric traction generally.

The Welsh Wizard and the Railways

WE referred in THE RAILWAY GAZETTE for March 29 to the possibility of further capital expenditure on railways. Mr. Lloyd George, in one of his recent New Deal speeches, mentioned that his experts had informed him that £150,000,000 could be spent on electrification. From the context it would appear that this figure included £30,000,000 for rural electrification, leaving £120,000,000 for railways. This is about one third of the figure in the Weir Report for complete railway electrification, which the authors of that report anticipated, on the then traffics, would yield 6·7 per cent. Although traffic has fallen heavily since 1929, it is now on the increase, and the cost of construction has fallen. If, as Mr. Lloyd George proposes, one-third of the lines were to be electrified, they would presumably be those on which the traffic is densest, but it is speculative whether the same yield could be expected from the capital involved. Figures given recently by Sir Herbert Walker show that there is every possibility of current being obtained at less

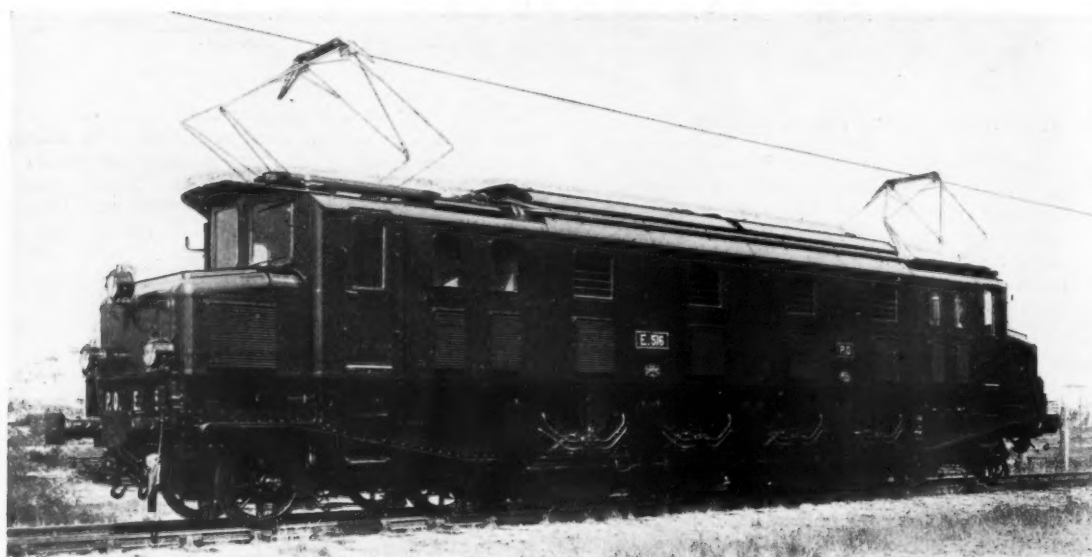
than 0·5d. per unit, the figure used in the Weir calculations, even with only a third of the lines electrified, and by carefully choosing and reorganising the routes to be converted, the adjacent steam-worked branch lines could be served by existing sheds and plant away from the electrified line, thus permitting of the maximum benefit being obtained from the conversion. But unless the Government is prepared to help by making up any difference between the actual yield realised and a reasonable rate of interest, and thus guarantee the railway companies against any loss incurred in giving the public the better facilities which electrification provides, there does not appear to be much likelihood of a scheme such as Mr. Lloyd George proposes being feasible. A guaranteed return of at least 4 per cent. with prospects of something higher, seems to be the least it would be reasonable to expect the railways to consider.

Electrification Progress

THE beginning of the Continental summer timetables on May 15 each year now invariably brings into use a number of new electrically-worked services, and 1935 is no exception to the rule. Rather is it the reverse, for one of the most important lines to be electrified in Europe for some time is to be opened on that date. This is the 186-mile Vierzon-Brive section of the Paris-Toulouse main line of the Paris Orleans-Midi Railway, on which a heavy traffic (especially in the summer) must be worked over numerous long grades of 1 in 100. It forms the last part of the second electrification programme of the old P.O. Company, and it will be only a matter of a little time before the two Central France routes from Paris to the Spanish frontier at Puigcerda and Port Bou respectively are completely electrified, for the section from Montauban to Narbonne is now being converted and the Brive-Montauban and Narbonne-Port Bou divisions appear in the Marquet plan as lines to be electrified by 1940. The old Midi Railway line from Toulouse to Puigcerda is already electrified on the French standard 1,500-volt d.c. system. Other Continental openings on May 15 are the south bank of the Tauern line on the Austrian Federal Railways and the Rotterdam-Hook of Holland line on the Netherlands Railways. April 1 saw the opening of the Voss-Eide electric line of the Norwegian State Railways—an entirely new railway, and April 23 the beginning of electric operation between Brussels and Antwerp over a line which is partly new and partly converted steam lines. In North America the Pennsylvania is now operating electrically all the passenger traffic on the New York-Washington route, and within the next few weeks all the goods traffic will be worked by electric locomotives. The South African Railways have announced an electrification programme covering the expenditure of over £1,000,000, within the next two years, and at long last Metro-Vick has received the £3,000,000 contract for the conversion of certain lines on the Central Railway of Brazil. Altogether, railway electrification is in a very healthy state.

IMPORTANT FRENCH ELECTRIFICATION OPENING

Heavily-graded main-line to the south is to be operated by electric traction with the beginning of the summer timetables

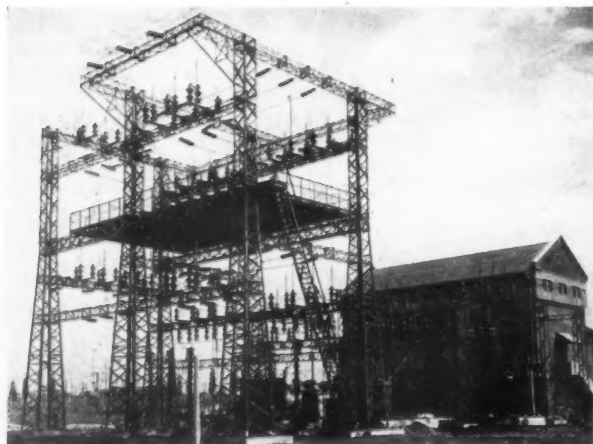


4,000 h.p. 2-D9-2 electric locomotive used on the Vierzon-Brive line of the P.O.-Midi Railway

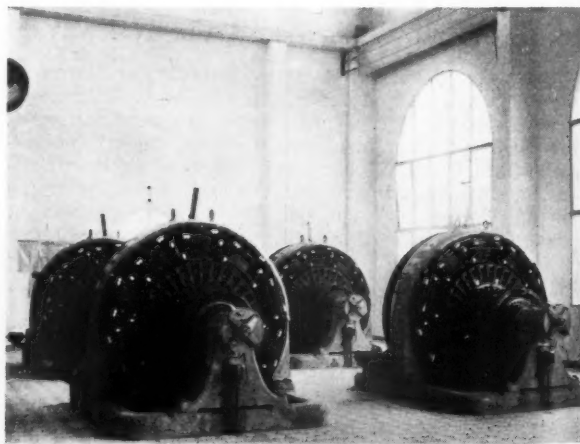
ONE of the most important electrifications to be completed within recent months is the extension from Vierzon to Brive of the electrified system of the P.O.-Midi Railway, which is to be opened to regular service on May 15. Extending to a length of 186 miles, this line forms one of the principal sections of the old Paris Orleans Company's main line from Paris to Toulouse, where connection was made with the Midi line to the Spanish frontier at Port Bou. Its conversion marks the completion of the second stage in the electrification of the P.O. main lines. The first stage was the electrification of the lines from Paris to Orleans and Vierzon and from Brittany to Dourdan, a programme which was completed in 1926. The first part of the second stage was the

electrification of the Orleans-Tours division (opened in July, 1933).

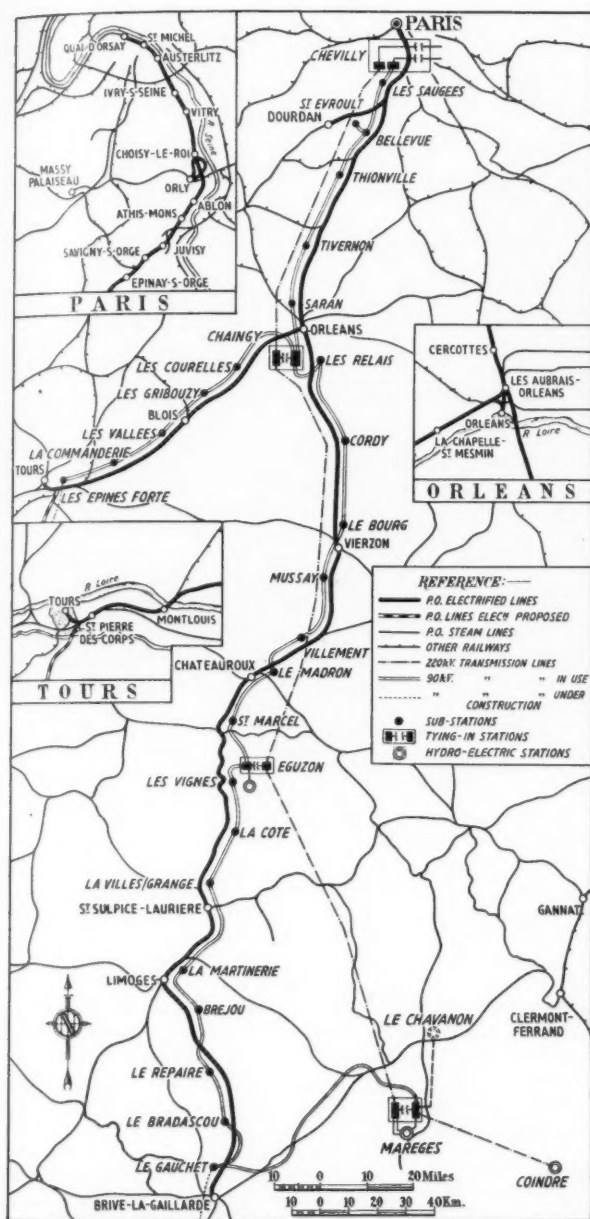
Numerous grades of 1 in 100 are encountered on the double-track Vierzon-Brive line, whereas the existing electrified sections of the P.O. have no grades steeper than 1 in 200, except for 6 miles of 1 in 125 near Etampes. The traffic density per route km. over the Vierzon-Brive division is 9,000,000 trailing tonne-km. yearly, compared with 10,300,000 trailing tonne-km. on the Orleans-Tours sections, and 19,600,000 trailing tonne-km. between Paris and Vierzon. The working of the Vierzon-Brive traffic is expected to account for the consumption of 61,000,000 kWh. per annum, measured on the low tension side of the substations. The electrified sections of the P.O. now



Outdoor h.t. gear at substation on the P.O.-Midi Railway



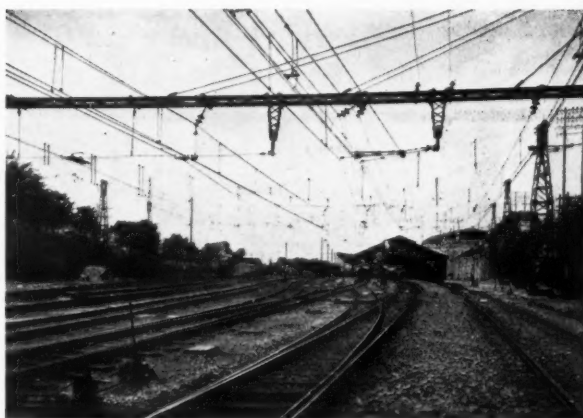
Interior of rotary converter substation on the P.O.-Midi



Map of electrified lines on the P.O. section of the P.O.-Midi Railway

amount to 405 route miles and approximately 1,180 track miles; on the associated Midi Railway 1,000 route and 1,785 track miles are electrically operated, making for the combined P.O.-Midi Company a total of 1,405 route and 2,965 track miles.

Current is being supplied from the hydro-electric generating stations in the Haut Dordogne, and is fed first down a 220 kV. line to Eguzon, where it is divided into two 90 kV. lines, one going north to Vierzon and the other south to Limoges. The northern line has been in operation since the electrification of the Paris-Vierzon line in 1926. A 90 kV. line has been built also between Limoges and Brive, and another between Brive substation and the high-tension tying-in station at Mareges, where the power lines from the generating stations converge. The h.t.



Overhead construction on P.O.-Midi Railway

transmission lines are tied into the system of the steam generating plants in the neighbourhood of Paris.

The three-phase 50-cycle 90 kV. current from the transmission lines is converted into d.c. at a pressure of 1,500 volts in 12 rotary-converter substations located as shown in the accompanying map. Each substation contains two groups of two in series at 750 volts, and like the equipment on the Orleans-Tours section, these substations are automatically controlled. Additional plant is incorporated in certain substations to look after the signalling and lighting requirements. The overhead lines are of the compound catenary type with separate steel supporting masts (spaced at 204 ft. span) for each track. The lines are sectioned at each substation and half-way between each pair of substations, high-speed circuit-breakers for this purpose being fitted in the substations and in sectioning cabins.

The locomotives which are to be used are of the same type as those which have been at work on the P.O. system for some years. The heaviest and fastest trains will be hauled by 2-Do-2 locomotives of 3,700/4,100 h.p. fitted with individual axle drive, and the ordinary passenger and goods trains by Bo-Bo locomotives of 1,400/1,700 h.p. with nose-suspended motors. Certain stopping passenger trains will be worked by 1,100 h.p. motor-coaches of the type used for the Paris suburban services.

NEW NORWEGIAN LINE.—On April 1 the new 17-mile single-phase electric line from Voss to Eide was opened. It forms a branch of the steam-worked Oslo-Bergen line, and the cost of construction and electrification amounted to 10.6 million kr. In 6½ miles the line rises 660 ft., and is being worked by three aluminium motor coaches with four trailers.

BRITISH TECHNICAL POOL.—To assist in the standardisation of electrical equipment for railway rolling stock in this country, a number of manufacturers have decided in agreed cases to pool information and technical designs, without interfering with the manufacture of such material in the works of the various companies concerned. For that purpose there has been formed a new company, Associated Manufacturers of Electric Traction Equipments Limited, of which the following companies are constituents: British Thomson-Houston Co. Ltd., Crompton Parkinson/Allen West & Co. Ltd., English Electric Co. Ltd., General Electric Co. Ltd., and the Metropolitan-Vickers Electrical Co. Ltd. It is probable that the new company is a direct development of the agreement concluded last year between the English Electric Co. Ltd. and Metropolitan-Vickers Electrical Co. Ltd. for the exchange of information.

HIGH SPEED ELECTRIC RAILWAY TRACTION

By Dr.-Ing. WALTER REICHEL

Double-bogie three-phase locomotive made by Siemens & Halske for high-speed trials in 1903



THE historic high-speed trials with three-phase electric traction on the military railway from Berlin-Marienfelde to Zossen, 30 years ago, yielded much information of permanent interest and value. In the late summer of 1901 the first of the two high speed coaches, together with the three-phase overhead line, were completed by Siemens & Halske, when it at once became apparent that the permanent way needed strengthening. The track, laid with 32 kg. per m. rails (64.5 lb. per yd.) and lightly ballasted, deflected seriously under the axle loads of about 15 tons. This, aggravated by the design of the coach, resulted in heavy pitching and swaying at speeds above 120 km.p.h. (74.5 m.p.h.). The inherent difficulty of maintaining contact between the collector bow and the overhead wires was increased, and during the course of a run at 160 km.p.h. (99.4 m.p.h.) the vehicle jumped at a road crossing, and a rail deflection exceeding 10 cm. (3½ in.) was noticed. As drastic changes were obviously necessary, the trials were interrupted and the following steps taken when preparing for a speed of 200 km.p.h.

1. New track was laid, with curves of 2,000 m. (6,562 ft.) radius, running rails of 42 kg. per m. (84.6 lb. per yd.) and check rails of 32 kg. per m. (64.5 lb. per yd.), making a total weight of about 300 kg. per m. (605 lb. per yd.) including closely spaced heavy sleepers and stone ballasting.

2. The wheel base of the six-wheeled bogies was increased from 3 800 mm. (12 ft. 5½ in.) to 5,000 mm. (16 ft. 4½ in.) in order to reduce the tendency to swaying.

3. Two sight tubes were fitted to the cab to aid observation of the track.

4. The behaviour of the contact bow was watched from the roof of the vehicle, the three-phase line being dead and the coach being hauled at 84 m.p.h. by a steam locomotive. The outcome of these observations was an improved type of bow, giving satisfactory contact at all speeds.

5. The home and distant signals were placed to suit a braking distance of 1.6-2.0 km. (1-1½ miles), and the brake blocks were provided with water cooling.

These measures proved successful, and both the Siemens & Halske and A.E.G. vehicles ran smoothly at 210 km.p.h. (130.5 m.p.h.). It is probable that 230 km.p.h. (143 m.p.h.) could have been reached had not caution outweighed a thirst for knowledge. The trials ended at the close of 1903, after a double-bogie electric locomotive, built by Siemens & Halske for speeds of 100-130 km.p.h. (62-81 m.p.h.) had hauled trains successfully, thus demonstrating the possibilities of electric traction for main lines.

New Standards of Speed

The electrification of main lines was stimulated by the Berlin-Zossen trials, but most of the later developments used the single-phase system owing to the greater simplicity of the line equipment. Though the 1903 trials demonstrated the practicability of running at 125 m.p.h., such operation could not then be commercially justified. Various plans were proposed for a high speed rail motor service between Berlin and Hamburg about this time, but all were based on the construction and equipment of about 155 miles of new track, involving prohibitive expense. Nobody apparently thought of hauling trains at even 100 m.p.h. by electric locomotives, but in 1911 the members of the Reichstag were taken from Dessau to Bitterfeld at 135 km.p.h. (84 m.p.h.) in an electrically-hauled train. The evolution of the electric locomotive was considerably delayed by the adoption of various rod drives. Ultimately, however, the individual axle drive won the day, since when the weights of all electrical equipment have been continually reduced. Technically, there is no doubt that speeds up to 100 m.p.h. could now be maintained by electric locomotives and railcars, but there is still hardly economical justification for attempting such speeds. At present it would suffice to operate express trains at 130-140 km.p.h. (say 81-87 m.p.h.), stopping trains at 100 km.p.h. (62 m.p.h.), and goods trains at 75 km.p.h.

Type	Bo-Bo Nose-Susp.	1-Do-1 Nose-Susp.	1-Do-1 Quill-Drive	1-Co-1 Nose-Susp.	1-Co-1 Quill-Drive	Co-Co Nose-Susp.	1-Do-1 Nose-Susp. or Quill-Drive
Reichsbahn series	E 44-003-39	E 16-101	E 17	E 05	E 04	E 93	—
Max. speed km.p.h.	80/90 (100)	110	110	110/130 (160)	110/130 (160)	65	160
One-hour rating at 90 p.c. of max. speed in kW.	2,200	2,900	2,800	2,200	2,200	2,520	3,000
Transformer weight in kg.	7,700	13,700	11,300	8,170	6,700	7,140	10,500
Total motor weight in kg.	15,040	20,500	24,400	15,360	14,700	21,600	20,500
Entire weight of el. equipment kg.	34,600	48,700	51,000	36,500	38,000	47,200	46,000
Entire weight of mech. part kg.	41,400	57,700	57,700	52,500	51,800	67,600	58,500
Ratio elec./mechanic. equip. kg.	46/54	46/54	47/53	41/59	42/58	41/59	44/56
Total loco. weight kg.	76,000	106,400	108,700	89,000	89,800	114,800	104,500
Axle loads, tonnes	4 × 19.3	15.7; 4 × 18.8; 15.6	15.2; 4 × 19.9; 15.1	15.1; 3 × 19.8; 15.1	15.2; 3 × 20; 15.2	6 × 19.5	15.6; 4 × 18.5; 15.6
Loco. weight, kg. per kW.	34.5	36.8	38.8	40.5	40.8	45.5	34.9

Locomotive Types for High-Speed Service

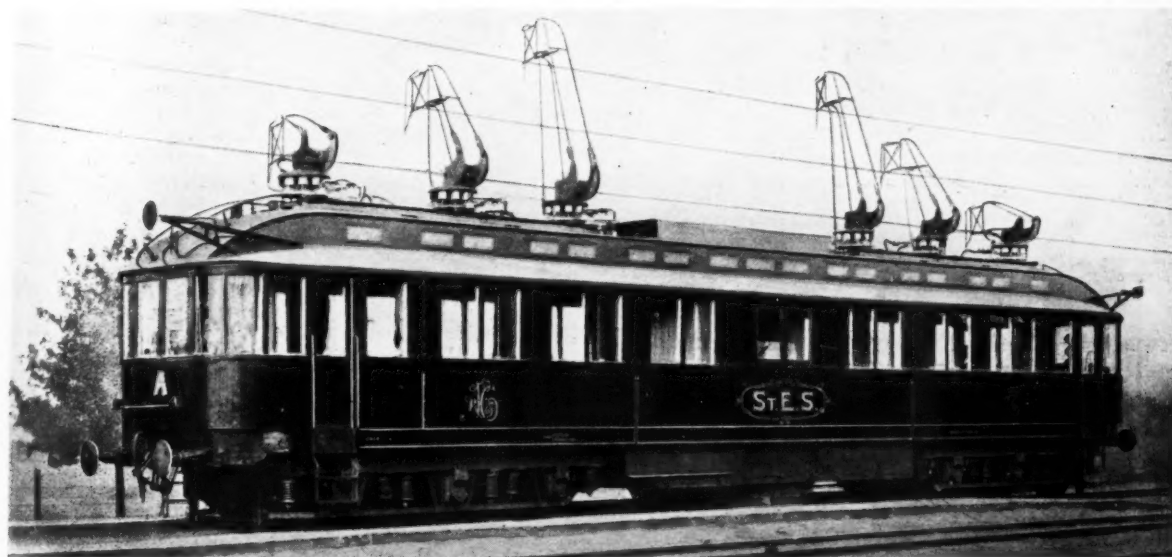
The accompanying table shows the weight, power output and unit weight per kW., at the one-hour rating, of recent German goods and passenger locomotives fitted with nose-suspended motors or A.E.G. quill drive.

It will be observed that the high speed locomotives give better figures than those built for lower speeds. Nevertheless the electrical equipment of the Bo-Bo type weighs about 46 per cent. of the total, and mechanical portion 54 per cent. The unit weight equals 34.6 kg. (76.5 lb.) per installed kW. on the one-hour rating. An even more favourable construction ratio of 44/56 should be given by a new 1-Do-1 type, designed for speeds up to 160 km.p.h. (100 m.p.h.), while the figures for a 1-Co-1 type locomotive, with a ratio of two carrying axles to three driving axles, as against two carrying and four driving axles, would be slightly less favourable. Even so, these figures are better than those of the German 4-6-2 express steam locomotives of Series 03. In this class the locomotive weighs 99.6 tons and the standard tender 73.6 tons, giving a total weight of 173.2 tons. It develops 1,840 horsepower on an hourly basis, or 1,350 kW., the unit weight being 128 kg. (283 lb.) per kW. As the steam locomotive is its own power-house this is not surprising; but compared with the total weight of the train, it is just

the 173.2 tons of the 4-6-2 type that detracts from its suitability for high speed working.

Another aspect of high speed locomotives, whether steam or electric, is that the efficiency of rod drive decreases with rising speed. With wheels of 2.2 m. (7 ft. 3 in.) dia., the driving wheel speed of about 390 r.p.m. at 160 km.p.h. (100 m.p.h.) is very high. The electric locomotive requires no rod drive, for it is easily possible to construct one of the 1-Do-1 type (see accompanying diagram), developing 3,200 kW. on the one hour rating, or about 2,900 kW. continuous rating, such as can handle 500-ton trains. Considering the short overall length of 16.22 m. (53 ft. 3 in.) the locomotive has been designed in a commendably compact manner. It has the satisfactory continuous installed power output of 2,910 kW. and 3,240 kW. on the one hour rating, at 90 per cent. of the maximum speed. The locomotive should be able to haul a 450-ton train at about 75 km.p.h. (47 m.p.h.) up an incline of 2.5 per cent. Similar constructional and power output features are found in Co+Co, Bo+Bo, 1-Co-1, and 1-Co+Co-1 locomotives, with corresponding increases in speeds of from 80 to 120 km.p.h. (50 to 75 m.p.h.) in order to meet goods and passenger traffic requirements.

It is imperative that greater attention be given to reducing air resistance by adopting streamlining. Exaggerated



The A.E.G. three-phase high-speed motor coach of 1903



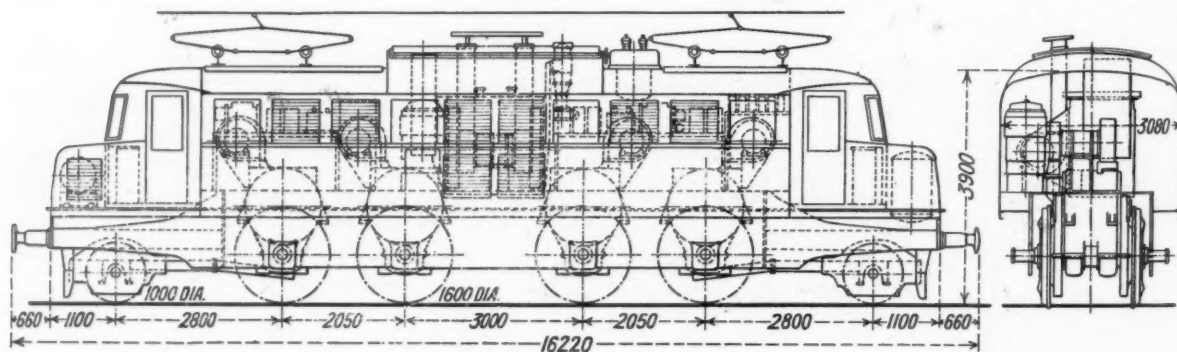
The 12-wheeled three-phase motor-coach built by Siemens & Halske (now Siemens-Schuckertwerke) for the Marienfelde-Zossen trials of 1903

streamlining necessitates diaphragms between the locomotive and the first coach—a difficult proposition—and a better solution is the construction of a parabolic front end, to which adjustable diaphragms or folding side walls can be fitted. It should also be possible to reduce air resistance by mounting a parabolic aluminium or duralumin cap on the folded diaphragms of the leading car, the equivalent surface being probably about 3 sq. m. (32.5 sq. ft.).

High Speed Electric Railcars

No less important than the evolution of high speed locomotives is the further development of electric rail vehicles. It should be simple to produce a type suitable for speeds of 160 km.p.h. (100 m.p.h.) on the lines of existing models. In Berlin and elsewhere, trains of the

city railways on the block-system are composed of two double-bogie light-weight motor units. These may either be run as two-car units or have sandwiched between them one or two 25-ton trailers, or two through carriages, other formations being equally practicable. Such trains would weigh 150 and 190 tons respectively, and at a speed of 160 km.p.h. (100 m.p.h.) would require power outputs of 720 kW. and 890 kW. They would also be able to negotiate 2.5 per cent. gradients at a speed of 108 km.p.h. (67 m.p.h.) with a power output of 1,400 kW. Each of the two double-bogie motor cars would house two motors, of 225 kW. on the one hour rating at full speed, and the same continuous kW. at 90 per cent. of the maximum speed. The remaining electrical equipment would be disposed to ensure a weight of 90 tons for a double-car unit (54 tons for mechanical equipment, 24 tons for electrical

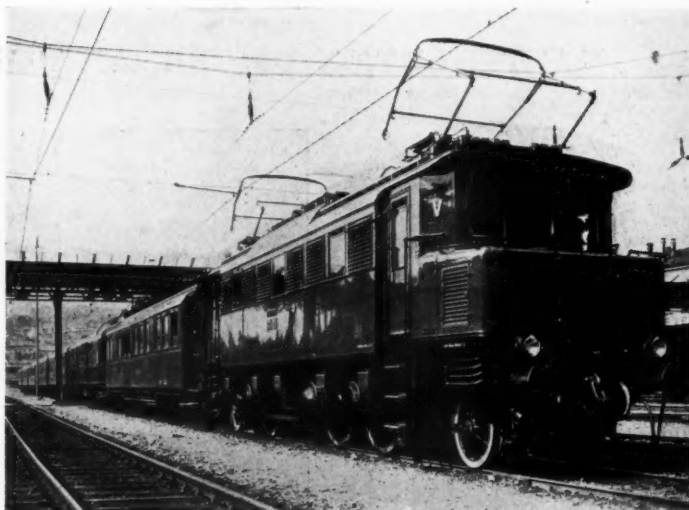


Design for a 1-Do-1 locomotive of 4,000 h.p. suitable for a speed of 100 m.p.h.

equipment, and 12 tons for passengers and luggage). Sixty per cent. would be the adhesion weight of the total, thus allowing a wide margin of safety in operation on well laid track. Both units would be connected by control circuit cables only, and the largest possible wheelbase (4.5 to 5.0 m., or 14 ft. 9 in. to 16 ft. 3 in.) and thoroughly resilient springing should be incorporated in the bogies.

The greatest freedom at speed, however, is obtained by providing an articulated car unit with six-wheeled bogies, each having a total wheelbase of 5 m. (16 ft. 3 in.) and employing a Jacobs-type bogie under the adjoining ends of both cars. Such a unit would be equipped with six 150 kW. motors, so that, of the nine axles, six, carrying about 70 per cent. of the total weight, would be motor driven. The weight of the electrical equipment would increase to 26.5 tons in such a car. Multiple-unit trains, with motor cars at both ends and trailers between, have the great advantage of being reversible at terminal stations in about three minutes, brake tests being unnecessary because the train is not uncoupled. Instead of a single block train it is also possible to form trains of two block units, thus making a train having four motor and four trailing cars and a total length of about 170 m. (560 ft.) with accommodation for approximately 550 passengers. Four, five and eight-car trains, developing 1,800 kW. or more, could be connected up, according to traffic requirements.

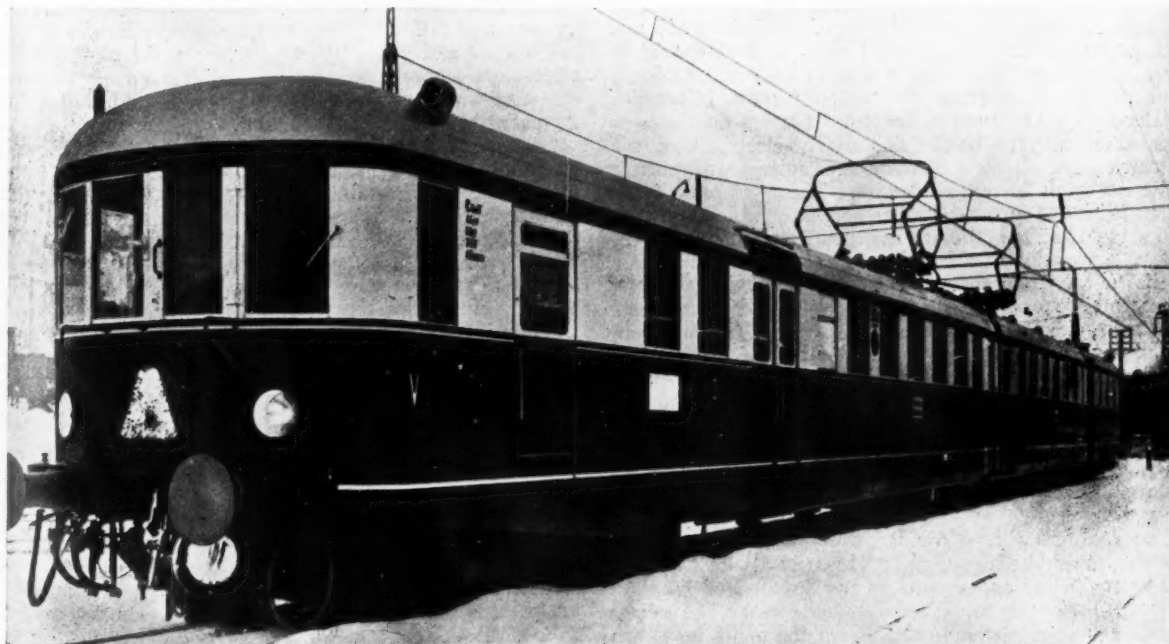
Just as motor cars are used for passenger traffic, double-bogie goods motor-coaches are practicable for high speed goods or mixed trains. They would be equipped with four motors, similar to those on the passenger cars, each developing 225 kW. and capable of speeds varying from 75 to 90 and 120 km.p.h. (47, 56 and 75 m.p.h.) Each vehicle would weigh about 66 tons when loaded, and multiple-unit control would permit the use of control trailers. With



High-speed 305-ton test train which reached a speed of 94 m.p.h. between Munich and Stuttgart

such cars it would be possible to operate mixed trains up to 400 tons in weight, including the motor unit, at 100 km.p.h. (62 m.p.h.). When four 150 kW. motors are employed, the car will weigh 60 tons, develop 600 kW. and be able to handle mixed trains of 275 tons. The foregoing data shows that much remains to be done in the development of high-speed goods motor-coaches, particularly as the variable gear ratio allows the adoption of a wide range of speeds varying between 90 and 120 km.p.h. (56 and 75 m.p.h.).

Twenty-eight new two- and three-car a.c. trains have recently been introduced on the Bavarian, Silesian, and Central Germany electrified divisions of the Reichsbahn. The two-car units have a seating capacity of 164 and an output of 1,200 h.p., and can attain 75 m.p.h. in 80 sec.



One of the new 1,200 h.p. single-phase electric trains on the Bavarian division of the Reichsbahn

ELECTRIFICATION OF THE CENTRAL RAILWAY OF BRAZIL

A £3,000,000 contract for the conversion of a busy 5 ft. 3 in. gauge line has been awarded to a British firm following protracted negotiations



Dom Pedro II station, the Rio de Janeiro terminus of the Central Railway of Brazil

AFTER months of complicated negotiations, the contract for the conversion of a densely-trafficked section of the Central Railway of Brazil was signed on March 14 by the Brazilian Government and the Metropolitan-Vickers Electrical Co. Ltd., of Trafford Park, Manchester. Leading particulars of the line to be electrified were given in the issue of this Supplement dated June 29, 1934, and since that date the main details of the work have been studied. In the financing of this contract, Metropolitan-Vickers has had the assistance of the Export Credits Department of the Board of Trade.

The work comprises the electrification of the main and suburban lines out of Rio de Janeiro and extending as far as Barra do Pirahy on the main line, and to Santa Cruz on the Mangaratiba line which form a bifurcation at Deodoro. The branch line from Guedes da Costa to Paracamby will also be electrified. The electrification will be carried out on the 3,000-volt d.c. system with current collection from an overhead wire. The total route to be electrified is 147 km. (91.5 miles), much of which is double and some quadruple track; the general plan of the railway with the positions of the substations and railway stations is shown on the accompanying map. The contract embraces main step-down plant; the system of transmission lines from there to the rectifier substations; overhead line equipment and track-sectioning cabins; multiple-unit suburban trains; and electric locomotives. The power will be controlled by the remote supervisory system and electric automatic signalling and point operation will also be provided. Car storage sheds, workshops including machine tools for the repair of the rolling stock, and complete offices for the housing of the electrification staff of the railway are also included in the contract.

The contract will be divided into two stages, the first covering the suburban system, terminating at Nova Iguaçu on the main line and Bangu on the Santa Cruz line and including the car sheds, workshops and offices. The second stage of the electrification extends on the main line up to Barra do Pirahy and to Santa Cruz and Paracamby on

the branch lines. For this second stage electric locomotives will be provided for hauling passenger and freight trains from Rio de Janeiro to Barra do Pirahy, and the suburban system will be extended to Paracamby and Santa Cruz.

As regards the suburban services, slow and fast tracks extend from Dom Pedro II, the terminal in Rio de Janeiro, all the way out to Deodoro junction, and suburban stopping services will be run on the slow tracks. It is proposed at first to run during the busy hours an eight-minute headway stopping service to Engenho de Dentro. In addition to this, the suburban stations beyond would be served by non-stop trains running to Engenho de Dentro on the fast tracks and changing over there to the slow tracks, afterwards stopping at each station. A certain number of trains would also similarly run non-stop to Madureira, thereafter stopping at each station.

In the first stage of the contract some of the trains will run out to Nova Iguaçu and some to Bangu, but in the second stage these trains will run right on to Paracamby and the others to Santa Cruz. It is also anticipated that the train services will be somewhat intensified and possibly the local service on the slow lines may be extended to Madureira.

The main-line passenger trains, which in the first stage will continue to be hauled by steam, will, under the second stage, be hauled by fast electric locomotives as far as Barra do Pirahy and similarly the freight trains will be hauled from the Maritima goods yard as far as Barra do Pirahy by special freight electric locomotives. Some small locomotives for the hauling of mixed trains, consisting of passenger and freight vehicles, will be also used.

Power Supply and Distribution

It is the ultimate intention to take a supply of power at 80 kV. three-phase 50 cycles at a main step-down station at Deodoro (the centre of energy distribution), where it is to be transformed to 44 kV. for distribution to five substations, but for the purpose of the first stage, power at 25 kV. three-phase 50 cycles will be fed direct

to substations Nos. 1 and 2, the equipments being so designed as to connect for either 25 kV. or 44 kV.

The main step-down station will be of the outdoor type and will consist of three transformer units each of 17,500 kVA., with the corresponding 80 and 44 kV. switchgear apparatus, it being the intention that one of these units shall serve as a standby. These transformers will feed into the 44 kV. busbar from which circuit breakers control three outgoing double-circuit transmission lines following the railway route and feeding their respective substations. Deodoro substation will also take its power from this busbar. The substations thus supplied with power are to be located at Manguiera, Deodoro, Belem, Martins Costa and Santa Cruz, numbered respectively 1, 2, 3, 4 and 5. The first four will each be equipped with three 2,500 kW. rectifier units, one being normally in reserve, and No. 5 will have only two such units, one of which is again normally in reserve.

The converter apparatus, comprising steel tank mercury arc rectifiers with their transformers, will convert the incoming 44 kV. supply to 3,000 volts d.c. This converter apparatus is to be complete with all the necessary auxiliary equipment which will take power from either one or other of a pair of auxiliary transformers, the switches being suitably interlocked. The rectifiers will be equipped with separate re-coolers for the main circulating water, and the d.c. output is to be smoothed by the use of resonant shunts and condensers to minimise interference with communication circuits. The substations will have outdoor transformers, auxiliary transformers and 44 kV. switchgear, but the rectifiers and control equipment will be housed inside the building.

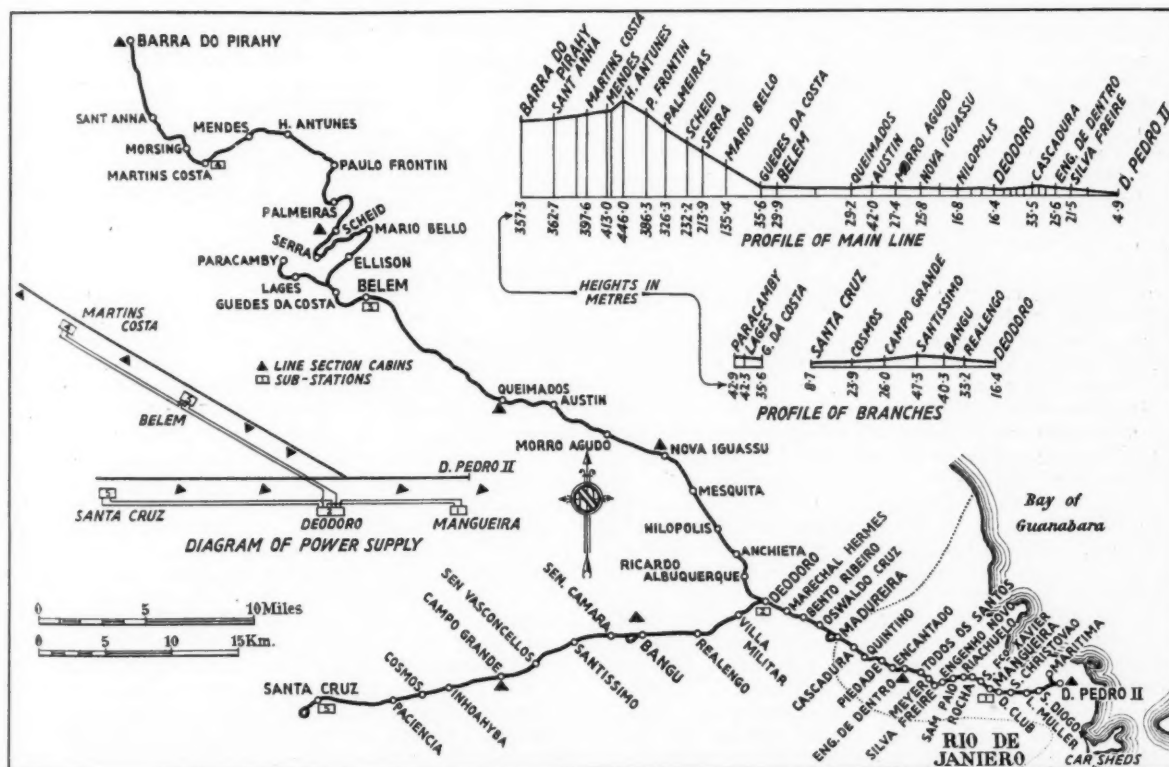
The rectifiers will supply power to the d.c. busbar, each equipment being protected with a reverse-current high-speed circuit breaker. The trolley wire is to be fed from

the 3,000-volt d.c. busbar through high-speed circuit breakers which will also serve to sectionalise the line at that point. The line is to be sectionalised further at various points between substations by track-sectioning cabins containing high-speed circuit breakers. The complete scheme comprises metering equipment at the Deodoro main step-down substation which will enable records to be made of the total power consumed by the system. The equipment also provides for measuring the power input to each individual substation.

For the purpose of supplying signalling power to the system, duplicate 44/4.4 kV. single-phase, 50-cycle step-down transformers, one of which is a standby, are to be installed at every substation. The transformer will feed the 4,400-volt single-phase overhead transmission line which will be tapped where required and connected to pole-mounted transformers to reduce the tension to 110 volts for signal purposes.

Remote Control

The energy supplied to the system, and the operation of all a.c. circuit-breakers, rectifying apparatus, and d.c. feeder and sectioning breakers, will be remotely-controlled from a central control room situated adjacent to the Deodoro substation. By this means the distribution and switching of the whole of the electrified system will be completely under the control and supervision of the operator at Deodoro. For the purpose of supervision and control a diagram will be installed in the control room to show the layout of the electrified tracks, and to represent the three-phase transmission lines, rectifier substations, overhead contact lines, and sectioning cabins, and to show all the a.c. and d.c. switches and feeder lines which it is intended to control centrally. This diagram will incorporate a control board on which the operator



Map of lines of the Central Railway of Brazil to be electrified by Metropolitan-Vickers

will manipulate the necessary keys for the desired operation of switches on any part of the system.

Remote control and indication will be provided for all the a.c. oil switches and the d.c. high-speed feeder breakers. Remote indication only is to be provided for the rectifier breakers as these will function automatically when the conditions are correct. Hand-set indicators are to be provided for the manually-operated a.c. isolating switches, since these would only be operated under exceptional conditions by the system operator, who would then set the indicators to their corresponding positions.

Remote indication of the summated a.c. load on each substation will be provided. An indication of low battery voltage in any substation is given by an audible alarm which will also be used to inform the operator of the automatic opening of any switch under his control. A similar desk type control panel is provided for purposes of signal power supply. The rectifiers themselves are designed for fully automatic operation, following remote controlled initiation. Each substation and track cabin is equipped with storage battery and charging plant for supplying control circuits and for lighting, &c.

Overhead System

The overhead construction provides for the equipment of 334 track km. (207 miles). The railway between Dom Pedro II and Deodoro has four and six main running tracks, and runs through a thickly-populated area. From Deodoro to Belem there are two main running tracks, and from Belem to Barra do Pirahy there is a Sierra section with two tracks through tunnels, cuttings and embankments having severe grades and curves of a minimum radius of 140 metres (460 ft.).

The equipment for all lines will consist of a single grooved copper contact wire of 125 sq. mm. (0.20 sq. in.) section, suspended by means of flexible droppers from a single catenary wire, which is to be of copper for the main tracks and of galvanised steel for secondary lines. The total copper section, including messenger wire, will be 225 sq. mm. (0.36 sq. in.) per track from Dom Pedro II to Deodoro; from Deodoro to Barra do Pirahy and to Santa Cruz it will be 250 sq. mm. (0.40 sq. in.). The catenary is to be supported by means of disc insulators suspended from steel supporting structures. The contact wire will be registered at structures by means of short register arms carried on a cross span, and on sharp curves a pull-off from a single mast at mid span is to be used to locate both the catenary and contact wires instead of an additional supporting structure.

The supporting masts will carry where required, in addition to the overhead track equipment, a double-circuit three-phase supply at 44 kV. to the substations, a single-phase 4.4 kV. power supply for signalling purposes, and a continuous earth wire for structure bonding. The steel structures are to be of two types. Those for two to four tracks are built up of broad-flange beams, and the masts grouted into cored holes left in the concrete foundations: for multiple-track construction, and for anchoring structures, British Standard sections, are to be used and the masts fixed on foundation bolts set in the concrete foundations.

The catenary and contact wires are to be rigidly anchored at each end of tension lengths of approximately 1.6 km. (one mile). On main tracks the equipment is to be sectioned by means of switches mounted on the structures at overlap spans, at the end of the tension length, and by means of high-speed circuit breakers in track-sectioning cabins alongside the track. For crossovers and sidings, the sectioning will be carried out by means of section-insulators inserted in the overhead line and con-

trolled by hand-operated switches. All rails of the track are to be bonded by means of rail bonds welded to the sides of the running rails and cross bonds between tracks are to be installed.

Multiple-Unit Trains

All the suburban electric trains will be operated on the multiple-unit system; 78 train units, each consisting of one motor-coach and two driving trailers will be provided, of which 60 will be furnished in the first stage of the electrification. The trains can be run as three, six or nine-coach sets, but generally it is expected that six-car trains will be used. Each motor-coach will be equipped with four 175 h.p. motors, which are to be of the self-ventilating type provided with field control. The normal make-up of the train will be a motor-coach in the middle and a driving trailer at each end, the train being driven from one of the driving trailers, but the motor-coach itself will also have a driving cab for use in special circumstances.

The control equipment will be the Metropolitan-Vickers electro-pneumatic unit-switch type and will be housed in switch group cases fixed under the coach. Series-parallel control with bridge transition and full automatic acceleration will be provided. A 13 kW. motor-generator for transforming the line current to 100 volts for lighting, control and auxiliary power apparatus, together with a motor-driven compressor for the supply of compressed air to the Westinghouse brakes and the control system, will be mounted under the coach.

The coaches are to be of steel construction and will be non-compartment stock; first and second class coaches will be provided, the first class having 68 seats and the second class 72 seats. The total crush-load seating and standing will be about 200 persons a car for the first class and 220 for the second class. The approximate tare weights of the coaches are estimated to be 50 tons for a motor-coach and 28 tons for a trailer. Wide sliding doors, provided with automatic door-operating gear, will be provided on each side of the coaches and controlled from either driver's cab, or under special circumstances by the guard. Collapsible concertina gangways of the Pullman type will be provided between cars, but not between train units. The couplers between the cars will be of the automatic type having the American Railroad Association Profile No. 10, Type "E," and will be arranged for uncoupling by a rotary movement.

Automatic air brakes of modern type will be provided, and will be arranged for quick service and emergency braking to operate independently, gradual release and emergency application always being available independent of what previous applications have been made. The bogie trucks will be provided with roller bearings; the motor-coach trucks will be of the built-up steel construction and the trailer bogies of pressed steel construction. Each motor-coach will be provided with two pantographs on the roof, only one of which normally will be in use. The trains will be operated at an acceleration of about 1.8 km.p.h.p.s. (1.1 m.p.h.p.s.) in order to maintain a reasonably high schedule speed with the short distances between stations in the suburban area, and will run at about 70 km.p.h. (43.5 m.p.h.) on level track.

Locomotives

Nine passenger locomotives of the 1-Co+Co-1 type will be provided; they will weigh about 130 tons in working order and will have a total rating of 2,862 h.p. for one hour and 2,340 h.p. continuous. These locomotives will be equipped with six nose-suspended motors each of 477 h.p., arranged for field control and for three different strengths of field. As there will be three different motor

combinations giving 0-33, 0-66 and full speed, each with three field strengths, there will be nine different economical speeds available. The passenger locomotives will have an articulated coupling between bogies and each bogie is provided with a pony truck. The maximum service speed is to be 90 km.p.h. (56 m.p.h.) on the more level parts of the railway, with a considerably reduced speed over the Sierra grades. The control will be of the electro-pneumatic type and the locomotives will be provided with regeneration to control the speed going down the Sierras, where heavy grades are encountered. The maximum weight of passenger train to be hauled will be 500 tons and one locomotive is to pull this train over the level portion and also over the Sierras without assistance from another locomotive.

There will be 15 freight locomotives of the Bo-Bo type, each weighing about 76 tons. They will be equipped with four motors each of 395 h.p., and the total power of the locomotive at the one-hour rating will be 1,580 h.p.; the continuous rating will be 1,320 h.p. The motors will be of the nose-suspended type, provided with field control giving three different speeds, and the control will be arranged for series-parallel operation for $\frac{1}{2}$ and full speed, giving in all six economical speeds. Like the passenger locomotives the freight class will be provided with regenerative braking. The maximum train weight to be hauled is 1,000 tons and this will be handled as far as Belem by one locomotive and beyond Belem over the Sierras by two locomotives driven from the leading locomotive, the locomotives being arranged for multiple-unit control.

In addition to these there will be six small locomotives for mixed passenger and freight trains; these will be of the Bo-Bo type weighing about 46 tons, and are to be equipped with four 175 h.p. motors as used for the multiple-unit trains but with different gear ratio. The maximum train is 450 tons on the level section but this train is to be reduced when going over the Sierras. These locomotives are not to be equipped for regeneration. All the locomotives will be equipped with Westinghouse automatic and straight air brakes.

Signalling

The power signalling installation will consist of both controlled and automatic sections. On the first stage of the contract, all-electric locking frames controlling power-

operated points and signals will be installed at four of the principal stations. At other stations mechanical locking frames will be used, the levers being electrically locked and controlling mechanically-operated points and shunt signals, but electric main line signals. Automatic signalling will be installed between signal cabins.

Throughout the system, a.c. track-circuits using vane relays will be employed. Generally double-rail track-circuits using impedance bonds will be fitted. The main three-aspect colour light signals will be of modern search-light pattern and many of these will operate in conjunction with electric train stops. The majority of the shunt signals will also be of the colour light type controlled from the signal cabins. Illuminated diagrams will be fitted above the locking frames for indicating to the signaller the position of all trains under his control. Relay rooms will be provided in each cabin and in addition welded steel weatherproof cases placed along the track will house additional apparatus such as relays, transformers and condensers.

Miscellaneous

The car sheds and office buildings will be at Sao Diogo, not far from Dom Pedro II, and the repair sheds at Deodoro. The latter will consist of the usual bays for the coaches and locomotives under repair, and will be provided with the necessary overhead cranes and also a common machine shop including wheel lathes, ordinary lathes, drilling machines, millers, and woodworking machinery necessary for the ordinary repairs to this class of rolling stock.

The principal companies sub-contracting to the Metropolitan-Vickers Electrical Co. Ltd. will be:—

British Insulated Cables Limited for overhead line and transmission.

British Thomson-Houston Co. Ltd., Rugby, for the rectifier units and the high-speed circuit breakers.

The General Railway Signal Co. Ltd., London, for the signalling installation, for whom Metropolitan-Vickers manufacture the apparatus.

Metropolitan-Cammell Carriage & Wagon Co. Ltd. for the coach bodies and trucks.

In addition building contracts are being placed locally in Rio de Janeiro. The work to be commenced immediately on this contract will comprise all that is included and described as coming under the first stage and this portion will extend over a delivery and installation period of about two and a half years.

ELECTRIFICATION IN NEW ZEALAND

The work of electrifying the North Island main trunk line from Wellington via the Tawa Flat deviation to Paekakariki is so far advanced that the erection of overhead wires will probably be completed by June. In the tunnels the contact wires are suspended from the roof, in which holes are drilled and plugged to receive the insulators. Putting these into the old tunnels on the way to Paekakariki was done between 8.30 p.m. on Sundays and 6 a.m. on Mondays, on account of the frequency of trains at other times. Boring was done on three nights by compressed air from a K class locomotive, which is fitted with larger capacity air pumps than other types, boring and grouting being done from wagon platforms. In the double-track tunnels there is 100 ft. between each pair of insulators, but in the lower single-track tunnels the contact wire insulators are only 50 ft. apart. In yards and where there are double lines the contact wires are supported from catenary cross-wires, but in the case of single lines the

catenary wires are supported on a tee-iron bracket with an angle in it, which projects from the top of the pole.

One of the features of the installation is the complete telephone system, which will be linked up with the rest of the North Island. A 40-pair telephone cable runs from Kaiwarra to the Hutt Road overbridge, where it is divided into two 20-pair cables, one going up the Wairarapa line and the other up the Main Trunk. The telephone cable will be supported where possible from the overhead poles, and where this cannot be done short poles will be put in between on a messenger wire. The cable is a loaded one, the first of the kind to be erected in New Zealand. Every 2,000 yds. between Wellington and Paekakariki there are loading coils, which are built into the telephone circuits, and do away with certain losses. The result is that transmission is obtained through the cable with as few or fewer losses than if the wires were run as aerials, and it is possible to talk perfectly through 26 miles.

NOTES AND NEWS

Dutch Conversion.—The Rotterdam-Hook of Holland line is due to be opened to electric traction on May 15, but it is doubtful whether the triple-car streamlined trains, which were to be introduced on the Netherlands Railways electrified system on the same date, will be ready then.

S.R. Electrification Results.—During the course of a paper read before the L.N.E.R. (York) Lecture and Debating Society, Mr. R. K. Ellson, of the Southern Railway, remarked that in pre-electric days 33 trains ran daily between London and Brighton, taking on an average

of no value to France, which, however, gave permission to Italy to convert the line.

Swiss Trials.—Extensive trials of the new Swiss Federal Railways motor-coaches (see *Electric Railway Traction Supplement* for July 27, 1934, and March 8, 1935) have been made recently, and the first unit is to go into regular service on May 15. On certain tests an average speed of 130 km.p.h. (81 m.p.h.) was maintained between Brügg and Baden, and 110 km.p.h. (68.3 m.p.h.) sustained up a grade of 1 in 83. Acceleration rates of



The east side of Brussels (Nord) station on April 23, the day on which began the electrified service to Antwerp (Central)

1 hr. 22 min. Today 53 trains do the same journey in an average of 1 hr. 11 min. London-Redhill services show an increase of 18 trains a day over the 37 daily steam trains, and take an average time of 36 min., as compared with the steam schedules of 44 min. Under the new regime no less than 83,800 electric miles a week were added, and 30,160 steam miles withdrawn, giving a total increase of 177.8 per cent. in mileage.

Austrian Electrification.—The south bank of the Tauern line, from Mallnitz to Spittal-Millstättersee, has been electrified on the Austrian standard single-phase, 15,000-volt, 16-cycle system, and electric operation will begin with the inauguration of the summer timetables on May 15. The north bank; from Schwarzach St. Veit (on the Innsbruck-Salzburg line), was electrified in December, 1933.

Franco-Italian Electrification.—The short length of line belonging to the P.L.M. between Piena and San Dalmazzo has been electrified by the Italian State Railways on the 3,600-volt, three-phase system. This 11½-mile section (crossing an eastern salient of France) forms part of the main Turin-Ventimiglia line, all the rest of which has been electrified for some time. All the adjacent lines in French territory being steam worked, electrification was

1.65 ft. per sec. per sec. and deceleration rates of 3.25 ft. per sec. per sec. were attained.

Pennsylvania Electric Services.—Gradual introduction of through electric passenger trains between New York and Washington began on February 10, and since April 7 the entire through and local passenger service has been operated electrically. This involves the movements of 639 trains daily, including 191 through and 441 local trains, but it is expected that within the next few weeks 47 through freight trains will come under electric haulage.

South African Activities.—In addition to the electrification of the Cato Ridge-Durban and Glencoe-Volksrust sections, conversion work on which is now proceeding, the South African Railways are to electrify certain lines with dense traffic in the neighbourhood of Johannesburg and Germiston, and a total outlay of £1,000,000 is to be budgeted for electrification during the next two years. In connection with this work, the British Thomson Houston Co. Ltd. has received an order for 18 steel-tank mercury arc rectifiers arranged with grid control to permit of regeneration, and a large number of high-speed circuit-breakers. These rectifiers will be installed in four substations on the Cato Ridge-Durban section and in five on the Glencoe-Volksrust division.